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Retirement Housing and Medical Facilities : Preference, Proximity and Price

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Retirement Housing and Medical Facilities:

Preference, Proximity and Price

A Dissertation Submitted to the Institute of Sustainable Development and Architecture in candidacy for the Degree of Doctor of Philosophy

By

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Statement of Sources

This thesis is submitted to Bond University in fulfilment of the requirements for the Degree of Doctor of Philosophy.

This thesis represents my own work and contains no material which has been previously submitted for a degree or diploma at this University or any other institution, except where due acknowledgement is made.

Signature: …………………………………….. Date: ……………………….

Abstract

This thesis examines the impact of proximity to medical facilities on the price of retirement housing in Australia, where legislation defines a category of residential housing as being exclusively for the use of retired persons. Research in the field of gerontology consistently shows proximity to medical facilities to be a significant driver of choice for residential location decisions of retired persons. It is hypothesised that increased proximity to medical facilities will have a positive effect on the price of retirement housing.

Two separate sources of data are used to examine this hypothesis. The first consists of sale prices of retirement houses in a defined geographic area in South East Queensland, Australia, between January 2011 and November 2012. The second is taken from a national survey of retirement village units conducted in 2001 and includes data from 109 retirement villages around Australia. Hedonic pricing theory is used to conduct a controlled experiment by examining the price differential of different retirement houses relative to their distance to two different types of medical facilities: a medical centre and a hospital.

The main results show proximity to a hospital to have a significantly positive impact on retirement housing prices, while no support is given to the effect of proximity to medical centres on price. The evidence suggests that people are willing to pay more for proximity to medical facilities when the services offered are more critical in nature, such as those offered at a

hospital, while every-day services that you may find at a medical centre do not impact the pricing decision. A range of control variables are included and the results are consistent with prior research on general residential housing.

The research adds to the body of knowledge by extending the existing generalised model of residential housing prices to examine the particular preferences of retirement-aged consumers. The results also provide support for the Australian government's Ageing-in-Place policy, indicating acceptance of community-based care delivery by retirees. Local governments and industry participants may also benefit from improved efficiency in location-based decision-making.

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"One of the best instincts in us is that which induces us to have one little piece of earth with a house and a garden which is ours, to which we can withdraw, in which we can be among our friends, into which no stranger may come against our will."

- Sir Robert Menzies, 1942

1 Chapter One: Introduction

1.1 *Overview*

This study focuses on the housing options available to people of retirement age in Australia. A recent report written by the National Seniors Productive Ageing Centre calls for "a more nuanced and detailed understanding of the diversity of housing, location and service needs and preferences of people in later life," stating two thirds of Australians change residences between the ages of 55 years and 75 years (Bourassa & Henderschott, 1995, p. 9). The report additionally finds that proximity to medical services such as a doctor and a hospital is often cited as a key consideration when choosing a suitable location, and that the intention to move was primarily influenced by a desire to find a house in which to live for the rest of their lives. The most current and comprehensive study of Australian retirement housing was published in 2002 and concludes with the following quote:

"The baby boomers in retirement represent a huge potential for market growth, but the industry needs to thoroughly investigate what products they will want and how much they are willing to pay." (Stimson, 2002, p. 216)

This thesis examines the factors that contribute to the price a person of retirement age will pay for housing in Australia. Specifically, the research is designed to identify the impact of proximity to medical facilities on the price of Australian retirement-specific housing. To date, there is limited research on retirement housing pricing in general, with no existing research examining the price effects of medical services. This thesis addresses this gap in the literature by developing a pricing model specifically for retirement housing. The model includes proximity to medical services as an independent variable, allowing an assessment of the impact of medical proximity on price.

The remainder of this chapter is separated into four additional sections. Section 1.2 identifies the research questions and objectives. Section 1.3 explores the motivation for the thesis and includes a discussion about sample data used in the analysis while Section 1.4 examines the purpose of the research. Finally, Section 1.5 lays out the structure of the thesis.

1.2 *Research Question and Objectives*

This study will examine the impact of proximity to medical facilities on the price of retirement housing. Increased proximity is expected to add utility to the consumption decision of purchasers of retirement housing, consequently increasing the price they will pay. The thesis will therefore address the following research question:

"In the Australian marketplace where legislation defines a subset of residential housing as being exclusively for the consumption of retired persons, does proximity to medical facilities increase the price they are willing to pay?"

This study aims to achieve the following objectives:

1. To develop a pricing model that explains the relationship between proximity to medical facilities and retirement housing prices.
2. To contribute to hedonic pricing theory as it relates to residential real estate by establishing a model to account for housing that is designed for, and predominantly purchased by, retirement-aged individuals.
3. To assist relevant stakeholders in making informed decisions about the provision of housing and care services to Australia's ageing population.

The thesis has the potential to contribute to the body of knowledge in three ways. First, the study reduces a gap in the literature by providing empirical evidence of the attribute-based price determinants of retirement housing. There are many studies using attribute-based pricing models for residential real estate in general, but very little work on retirement housing in particular.

Second, the Australian government may utilise the knowledge of this particular type of care provision in informing their policy decisions related to housing and care for the ageing population. Housing affordability and care provision for the aged are areas receiving significant attention and require careful analysis and planning for the future. The Commonwealth Government's existing policy of Ageing-in-Place is shifting responsibility for the provision of care into the community, and this study may assist relevant stakeholders in more effectively delivering that care.

Third, the knowledge of how much retired persons will pay to be close to medical facilities may assist local councils in making effective town planning and zoning decisions regarding the potential co-location of care and housing. By improving the economic analysis supporting zoning decisions, local councils can assist retirement village developers to more effectively locate future retirement housing developments, consistent with consumer preferences. The increased location-based effectiveness of retirement specific housing may lead to improved housing affordability, with consumers paying for attributes they actually desire rather than attributes that councils and developers in the past have presumed they desired.

1.3 *Motivation for the Thesis*

There is a lack of existing research examining the price effects of retirement housing preferences in general, and the preference for proximity to medical services specifically. The majority of literature has stopped at the identification of location-based drivers of choice for consumers of retirement housing and fails to address the price effects (Dunbar, 2005; Duncombe et al., 2001). Coupled with the call by Stimson to specifically examine the determinants of price for retirement housing, this provides a strong impetus for research in this area and is discussed in more detail in Sections 1.2.1 and 1.2.2. In addition, the combination of two existing sets of data has provided access to a unique opportunity that links location-based drivers of choice to the prices of retirement-specific housing. This data is very rich in detail and its importance is discussed further in Section 1.2.3.

1.3.1 The Price of Retirement Housing

Retirement specific housing is a category of residential real estate that typically caters to purchasers aged 55 years and over. As the baby boomers enter into retirement age there will be increased investment into providing housing suitable for their unique needs. The attributes of a piece of real estate that are attractive will differ as a person ages. In terms of location, research shows that neighbourhood preferences change from proximity to places such as a central business district for employment opportunities and desirable schools for a family's children to characteristics that enhance a sense of safety and access to healthcare services (Duncombe et al. 2001; Hunt, 1991).

Significant investment will be made in the coming years to cater for the housing needs of the retiring baby boomer generation. In Australia the number of people aged 65 years and over is expected to more than double from 2.7 million in 2006 to over 5.4 million in 2027 (Australian Bureau of

Statistics, 2008a). In the United States there will be 36 million more people aged 65 years and over in 2030 than there were in 2003 (He et al. 2005).

Retirement specific housing is an increasingly important component of the Australian residential real estate market. There are two forms of Australian residential housing that are most readily identifiable. The first is the retirement village unit, a residence contained within a retirement village. The second is a relocatable home built in a development targeting those of retirement age.

Section 5(1) of the New South Wales Retirement Villages Act (NSW) 1999 defines a retirement village as *"a complex containing residential premises that are predominantly or exclusively occupied… by retired persons who have entered into village contracts with an operator of the complex."*[1] With 75% of Australians over 65 owning their home outright, and the purchase of a retirement village unit remaining *"the main avenue through which older people convert their existing housing assets into purpose built (retirement) accommodation"* (AHURI, 2004, p. 4), demand for retirement village units is expected to remain strong.

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[1] Retirement Villages Act 1999 – Section 5 (1). McGovern and Baltins (2007) provide an excellent discussion of the evolution and structure of the Australian retirement village industry, and this is included as Appendix One for reference purposes.

Industry experts estimate approximately 5.25% of the Australian population aged 65 years and over lives in a retirement village unit, and predict the construction of an additional 140,000 units is required in the next fifteen years at a cost of approximately A$42billion (2008 dollars) to satisfy demand (McMullen & Sam, 2008). The same report shows penetration rates in some areas of the country are even higher, with Western Australia approaching 7% and South Australia 8%. A recent study of villages in the Gold Coast City Council in South-East Queensland identified 12.4% of the population aged 65 years and over was living in retirement-specific housing (Anderson, 2008). Retirement village units are considered to be a component of residential real estate rather than an aged care facility (Commission for the Future, 1992).

The second category of retirement housing is typically marketed as an 'Over 50s Lifestyle Village' and is developed in Queensland under the Manufactured Homes (Residential Parks) Act (2003). Such villages are relative newcomers to the retirement housing landscape and are being utilised by developers for the flexibility provided in the legislation. The Act itself does not impose age or lifestyle restrictions on the residents, however developers impose the restriction through by-laws created for the management of the village. Due to the lack of a requirement to register such lifestyle villages with a central body, the exact number of villages is unknown.

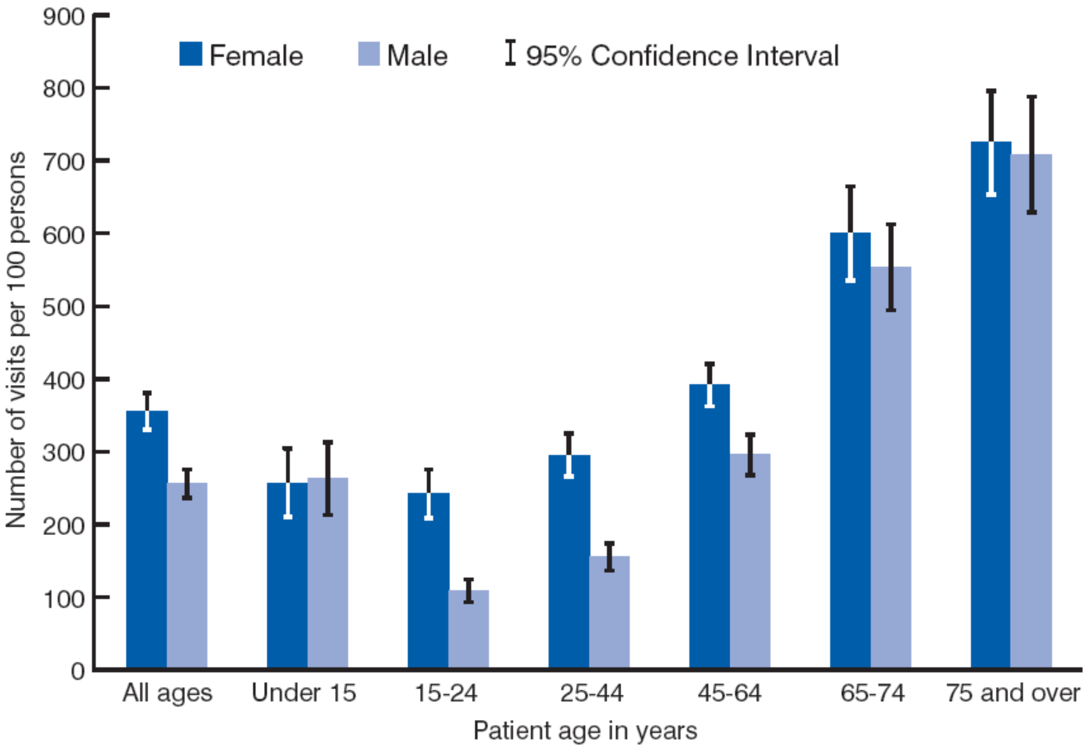
Accurately identifying the location-based attributes that drive the amount a retiree is willing to pay for retirement housing may lead to improved town planning decisions and more efficient pricing, matching the location of future retirement-targeted developments with the unique preferences of their purchasers.

Stimson (2002, p.230) states, *“the location of the village and its proximity to services is an important consideration as it impacts on the saleability of the units”*. Despite this evidence, the comparative sales technique referencing ordinary residential real estate is the most commonly used method to price retirement village unit properties. This method may include preferences that are not representative of the consumers of retirement specific housing, while neglecting significant attributes unique to this category of real estate.

The increase in the number of people aged 65 and over also has significant ramifications for the medical services industry. Research conducted by the US-based National Center for Health Statistics estimates a person aged 65 years and above visits a physician in his or her office over three times per year more than a person aged 25-44 (Cherry et al., 2008). This is reproduced graphically in Figure 1.

Combining an increasing aged population with increased physician visitation rates results in a significant increase in demand for physicians and the facilities in which they conduct business. A recent article estimates the need to construct an additional 140 million $feet^2$ (13 million $metres^2$) of medical office space between 2010 and 2020 (Australian Bureau of Statistics, 2003), an increase of roughly 35,000 $feet^2$ (3,250 $metres^2$) for each of the 4,037 hospitals registered in the American Hospitals Association database in 2006.

Figure 1: Annual Rate of Office Visits, USA 2006



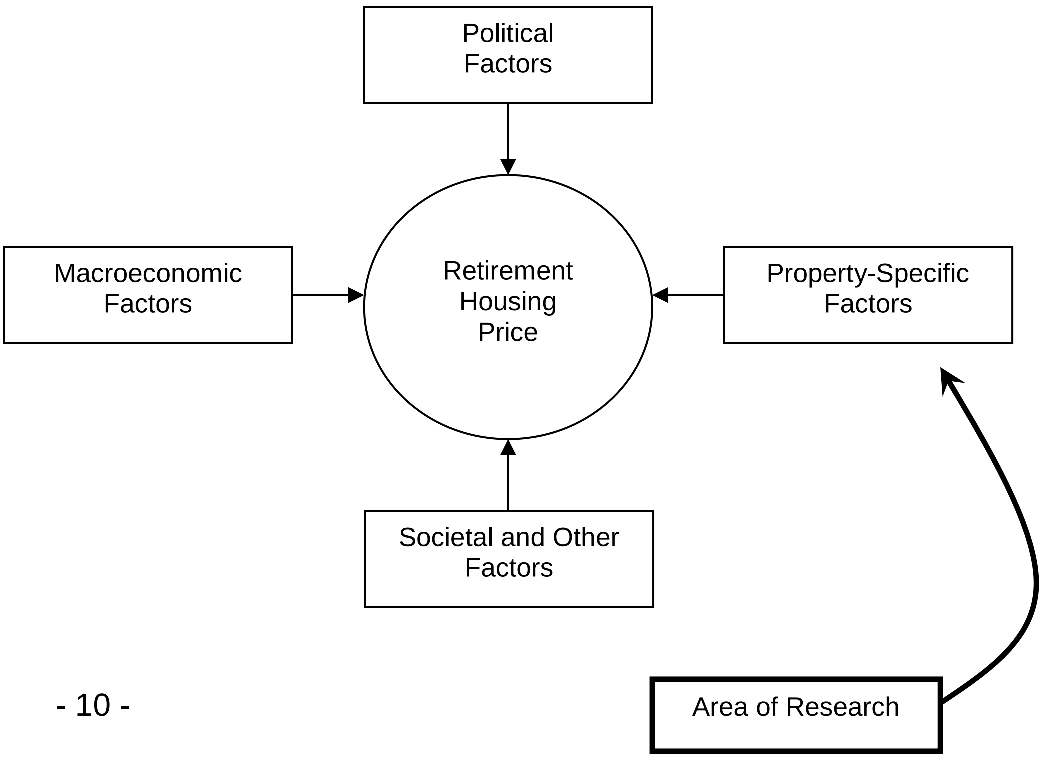
Source: (Cherry, et al., 2008, p. 3)

In the field of gerontology, access to medical facilities is consistently identified as a major influence on the location decisions of retirement aged people (Abelson et al., 2005; Duncombe et al. 2001; Gibler et al 1998; Merrill & Hunt, 1990). Coupled with the recent call for improved understanding of the location preferences of consumers of retirement specific housing, it is timely to examine in more detail the effect of proximity to medical facilities on retirement housing prices.

1.3.2 Residential Real Estate Pricing as a Research Domain

The influences on residential real estate prices are many and varied, taking into consideration political, macroeconomic, societal and property-specific factors. While this study will focus on property-specific influences on housing prices, the following sections examine each of these four categories.

Figure 2: Area of Research



1.3.2.1 Political Factors

Governments, through specific decisions or general policies, can have an influence on the price of residential real estate. This section seeks to identify some macro-level influences political factors can have on residential real estate to give greater context to the pricing model, and then to highlight how specific policies such as those that examine the best way to deliver care to the aged can also influence house prices. It is these policies that are more relevant to this study as the results may provide evidence on which policy decisions can be made.

Influences such as taxation, social policy and zoning decisions have been shown to have an effect. Research has shown a negative relationship between inheritance tax and residential property prices (Bellettini & Taddei, 2009). Australia abolished what was known as death duties in 1979 however the recent Henry Review into the future of the Australian taxation system stated that a "bequeath" tax would be economically efficient although unlikely to be implemented in the short term due to its controversial nature.

Stamp duty on property transfers is another contributing factor, with calls to reduce stamp duty on downsizing transactions to assist with housing affordability for the aged (Clare & Tulpule, 1994). Changes in other Australian taxes, including property taxes, the Goods and Services Tax and capital gains taxes, have been shown to affect housing prices (Abelson et al., 2005). In the United States both county and city taxes have been shown to have a negatively influence on residential housing prices (Cebula, 2009).

The impact of zoning decisions on residential housing prices has received broad attention globally in the urban planning literature, with consistent evidence showing significant effects (Adams et al., 1968; Coulson & Lahr, 2005; Glaeser & Gjourko, 2003; Hushak, 1975; Isakson, 1997; Jones et al., 2010; Meese, 1991). This is confirmed recently in an Australian context with James Hansen's work on house price modelling in Sydney, Melbourne and Brisbane showing zoning to be a significant explanatory variable for house prices (Hansen, 2009).

Shifts in social policy have the ability to alter the supply and demand characteristics of the purchase transaction. The late 1980s and early 1990s saw a distinct shift in the attitudes of the Commonwealth Government towards housing for the aged. Targeted home ownership policies and direct involvement in the funding of public housing were removed in favour of an emphasis on income supplements and rent assistance (Yates, 1997). This general point of view, known as Ageing in Place, has been shifting the responsibility for care of the aged away from institutions and into community settings (Kendig & Neutz, 1999). Direct government support for housing has instead been targeted at the more politically sensitive younger generations through programs such as the First Homeowners' Grant.

Limited direct housing assistance for the aged exists in programs such as the Assistance with Aged Care and Housing for the Aged programs, providing for just 6,000 people Australia-wide (Morris et al., 2005). Significant funding has been placed instead behind programs to deliver care in the community. Examples of policies and programs implemented to assist in the provision of services include Home and Community Care (HACC), Community Aged Care Packages (CACP), Extended Aged Care at Home (EACH), and EACH Dementia.

HACC is a joint program of the Commonwealth and the State and Territory governments. In 2010/11 the combined resources contributed to HACC is expected to be approximately $2 billion, of which the Commonwealth Government will contribute 60% and the State and Territories 40%. This money provides for generalised care services to both the aged and the young requiring care, including nursing and allied health care, meals, domestic and personal assistance, home alterations, counselling and transport (Department of Health and Ageing, 2011). The care can be specifically targeted to an individual's particular requirements through CACP, EACH and EACH Dementia. There are also more targeted programs such as Veterans Home Care. An Aged Care Assessment Team must assess the individual's needs and determine if they qualify for any of these packages.

CACPs are individualised care programs for the aged in their own home, charging a subsidised fee for tailored services such as meal preparation, laundry, transport, gardening and personal care. EACH is designed to provide highly tailored care to particularly frail individuals in their own homes. Services offered include registered nursing and allied health care in addition to those services offered under CACP. The EACH Dementia program extends these services to offer care specific to the needs of individuals exhibiting signs of dementia. Medicare provides subsidies to carers under these programs, offering daily subsidies of $36.05 for CACPs, $120.50 for EACH and $132.89 for EACH Dementia.

These programs are targeted to assist the care needs of roughly 500,000 people aged 65 years and over (19.7% of the population) that have a profound or severe “core activity limitation” requiring care (Australian Bureau of Statistics, 2008b). One major issue with these programs is the availability of skilled carers. The National Centre for Social and Economic Modelling (NATSEM) notes that in 2001 there were 57 carers for every 100 people 65 years and over requiring care, with predictions the ratio would reduce to 35 carers per 100 by 2030 (NATSEM, 2004).

A second major issue is the fact that the care is required to be delivered in the individual’s home. This poses a difficulty for marginalised Australians who may be struggling to afford housing as a prerequisite for receiving care. The Commonwealth Government does have a program specifically targeting this section of society (Assistance with Care and Housing for the Aged), but the centres are mainly situated in inner-city suburban locations. In 2008 the government estimated the number of families headed by a frail individual aged 70 years or over needing care who were at risk of homelessness at 112,000 (Department of Health and Ageing, 2008).

1.3.2.2 Macroeconomic Factors

Different macroeconomic factors have been shown to have both long-term and short-term influences on residential real estate prices. Globally, long-term determinants include economic growth, inflation levels, interest rates, equity prices and bank lending practices (Hofmann, 2004; Oikarinen, 2009; Tsatsaronis & Zhu, 2004). There have been several studies examining the Australian residential housing market specifically.

In response to a period of increasing house prices during the late 1980s the Commonwealth Government commissioned two research firms, Applied Economics and Travers Morgan, to assess both the affordability and price determinants of residential housing. Using data from the Valuer-General's office and BIS-Schrapnel for Sydney, Melbourne and Adelaide for the period 1965-1989 they found lagged house prices, house prices in other cities, average weekly earnings, real interest rates and net migration to be the main explanatory variables (Applied Economics & Travers Morgan, 1991). Two distinct public policy changes, being the introduction of housing assistance payments and the cancellation of the negative gearing tax allowances between 1985 and 1987, also significantly impacted house prices. The data used were annual figures and consequently the study suffers from a relatively low number of observations (25). The firms attempted to use quarterly data but the models suffered from a lack of explanatory power.

Using data from the Real Estate Institute of Australia for the cities of Sydney, Melbourne, Adelaide, Brisbane, Canberra and Perth, Bourassa and Henderschott's (1995) study identified growth in real wages, the real after tax interest rate, net migration, lagged real house prices and real material costs as significant determinants of housing prices. The model's explanatory power was reasonable at R^2=0.51 using data from 1980 to 1993, however the paper did not discuss the issue of serial correlation.

A follow-up study by Bodman and Crosby (2004) used the same data source (excluding Canberra) for the expanded time period of 1980-2003 to examine the effects of a significant rise in residential property prices during the late 1990s and early 2000s. This study found no support for lagged housing prices, real interest rates, real rental rates or income. City population was shown to have a weak relationship with prices, while real material costs exhibited significant explanatory power.

Both the Bourassa and Henderschott (1995) and Bodman and Crosby (2004) studies show real material costs to be significant contributors to residential housing prices. Fundamentally, this should only occur if new construction adds significantly to the size of the existing stock of housing, otherwise the value of the existing stock will act as the supply-side determinant of price (Abelson, et al., 2005). The literature suggests that increased real material costs will have a downward effect on land prices rather than affecting housing prices in aggregate (Abelson, 1999).

More recent research looking at Australian evidence has narrowed the aforementioned factors down to a positive influence by increases in real GDP (a proxy for income), mortgage credit levels and building permits, and a negative influence by increases in publicly traded equity prices (Glindro et al., 2008). Significant supportive work has been performed on the effect of bank lending rates (Chen, 2001; Gerlach & Peng, 2005), which is expected to continue given the recent global financial crisis. The length and complexity of planning and construction have been shown to be short-term determinants of housing prices (Tsatsaronis & Zhu, 2004).

1.3.2.3 Societal Factors

Society as a whole is changing in a number of significant ways. It is well known that demographically we are ageing. Improved healthcare, increased labour force participation by women, later ages of marriage, increased divorce rates and lower fertility rates all impact on the timing and choice of type of residence and location (OECD, 1996). This is consistent with existing literature on the influences on decision making related to relocating to retirement specific housing (Gardner, 1994; Manicaros & Stimson, 1999).

Perceptions and widely-held beliefs may also influence the pricing mechanism for retirement housing. With the onset of the baby-boomer generation we will begin to see purchasers of retirement housing looking for more choice in terms of built form, services, quality and amenity (Kendig & Bridge, 2007). The authors cite a prosperous period involving significant cultural exposure and opportunities for wealth development to be contributing factors to this shift in preferences. They also caution policy-makers on the ability of the baby boomer generation to afford the retirement housing scenario they desire. Modelling by the National Centre for Social and Economic Modelling predicts the potential for significant gaps between the desires of the retiring baby boomers and their financial means (NATSEM, 2004). With the increasing needs of care for older people (Australian Bureau of Statistics, 2004), a significant challenge for social policy will be the provision of care for the ageing population (Kendig & Bridge, 2007).

1.3.2.4 Property-Specific Factors

The aforementioned research most commonly looks at residential real estate prices in general, using price indices as the dependant variable to highlight impacts at an aggregate level. Such indices include the S&P/Case-Schiller home price indices in the United States and the ABS-published House Price Indices and RP Data/Rismarck Home Value Index in Australia.

Residential real estate is one of the world's largest investable assets, with each individual asset possessing a distinct set of characteristics that differ from other pieces of real estate. This heterogeneity derives from two fundamental characteristics. First, the fixed nature of each unique location precludes two perfectly identical pieces of real estate. Second, a purchaser is very limited in their ability to be able to pick and choose between competing desirable attributes of a piece of real estate as each product is relatively fixed in composition: a purchaser cannot easily choose a particular house and then say they would like it with two extra bedrooms, for example. Even when constructing a house, the consumer is constrained by topographical and regulatory considerations. Consequently, a pricing model that examines the attributes of a good rather than the good itself is theoretically preferred.

The major alternative pricing method to attribute-based models is the repeat sales method. The repeat sales method is often used for mass house price appraisals by analysing past transactional data in a defined location on houses that have sold at least twice and not for cross-sectional analysis as proposed in this study.

The most notable examples of the use of repeat sales methodology are the S&P/Case-Shiller Home Price Indices. The indices provide residential real estate price movement information for twenty American metropolitan cities, in addition to national, ten-city and twenty-city composite indices. Including data for approximately 75% of the United States residential housing market, the indices measure movements in house prices at a consolidated level, rather than specifically for an individual house. Indeed, in a paper published in The American Economic review, Case and Shiller (2010, p. 125) state *"individual housing price changes are not very forecastable"* using indices based on repeat sales methodology. A study focused on the Australian marketplace concludes *"that regression-based measures are useful for measuring house price changes in Australia"* (Hansen, 2009, p. 132).

A large body of research has developed since the 1970s examining the effect of particular characteristics or attributes of real estate. The research stems from Sherwin Rosen's seminal theory of implicit prices (Rosen, 1974), which itself built on Kelvin Lancaster's identification that "*The good, per se, does not give utility to the consumer; it possesses characteristics, and these characteristics give rise to the utility*" (Lancaster, 1966, p. 134). Rosen's theory has been operationalised through the hedonic pricing model, a method that prices real estate as a whole by pricing each attribute that derives utility for the consumer. The application of this research technique is extremely varied. Studies have estimated the effect of structural, neighbourhood, and location attributes, as well as the effect of contract conditions and time on house prices. These variables are discussed in detail in Chapter 2.

1.3.3 Retirement Housing Price Data

The sample data used for this study is sourced from two distinct collection periods. The first data set was collected specifically for this study and comprises commercially sensitive information on retirement housing in a defined geographic region of the Australian state of Queensland. This data was obtained through personal favours by connections of the author in the industry and is unique in the sense that it contains information on the sale prices of properties that would otherwise be unavailable to the general public.

The reason for this secrecy is that the transactions are on a category of residential real estate known as over-50s lifestyle villages, where purchasers buy the house in which they live but do not have any interest in the land: they rent their lot from the land owner. There is no legislated requirement for the recording of the transaction with any government entity and such data is considered commercially sensitive. Adding to the difficulty in obtaining this kind of information is the fact that there is no central body (such as the Retirement Villages Association of Australia) with which the over-50s lifestyle villages are required to be registered. The strength of this data is its currency and its accuracy, while it suffers from the fact that it is from a defined submarket and may be compromised in its generalisability.

The second source of data is derived from surveys used to support Stimson's (2002) study. There are several reasons why this aged data is deemed to be of particular value and unlikely to be replicated to the same extent in the foreseeable future. The first reason relates to the access to industry participants from which to source the data. The retirement village industry in Australia is quite fragmented, with a large number of operators owning individual or relatively few villages (McGovern & Baltins, 2002). Because of the lack of existing research in this field it is necessary to draw data from the general Australian population, allowing future research a base from which to explore and compare. To obtain access to such generalisable data as an individual researcher is logistically very difficult and, given the structure of the Australian retirement village industry, virtually impossible to obtain with any breadth or depth. To gain this depth necessitates some sort of institutional support.

One of the sponsors of the original surveys was the national industry body, the Retirement Village Association Australia (RVAA). This sponsorship facilitated access to a large number of accredited retirement villages across Australia and contributed to the extraordinarily high response rate of 53.3%, comprising data from 985 retirement village unit owners in 111 retirement villages across all Australian states and territories except the Northern Territory. [2] When approached to support the most recent

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[2] The Northern Territory is the least developed of all States and Territories in terms of Retirement Villages. The combination of the nation's lowest proportion of the population being aged 65 years and over with the lowest penetration rate of retirement village living of

Australian Research Council Linkage Grant-funded research into retirement housing the national body declined to participate. Without the involvement of the RVAA it is unlikely a data set with such depth of information could be replicated.

The data needed for this study was spread between the two aforementioned surveys, requiring a matching process to be developed to link the price data contained within one to the property data contained within the other. This matching process is described in more detail in Section 3.2.2 on page 80.

The retirement housing industry has undergone significant change in the past decade: state governments have altered the legislation that controls the manner in which retirement villages operate, Australia has seen a significant boom and subsequent decline in general residential property prices, federal government social policy has continued to alter in terms of its focus on the provision of support to the ageing population, capital markets have suffered substantial shocks, tax rates affecting the industry have altered, the Goods and Services Tax was introduced and people's preferences concerning retirement village living have altered. While the

less than 0.4% of those aged 65 years and over has resulted in a lack of retirement village development. There is currently just one Retirement Village in the Northern Territory registered with Retirement Villages Association Australia.

preceding list is not exhaustive, it represents a number of factors that have altered the landscape for retirement housing decision-making for Australia's ageing population.

The years from the early 1990s to 2000 were a time of relative stability in general macroeconomic conditions for Australia (Australian Bureau of Statistics, 2002). Both inflation and unemployment were relatively stable contributing to a period of sustained low interest rates that continued until the mid-2000s. July 1st 2001 saw the introduction of The New Tax System and its associated Goods and Services Tax. There was a sharp spike in inflation during this time. The 1990s were a time of sustained economic growth, averaging over 3.5%pa growth from 1993/4 until 2000 when it fell to 2.0%pa. These factors, and their implications for the importance of this data set, are discussed in more detail in the following sections.

1.3.3.1 State Government Legislation

Rather than being federally-regulated, retirement villages are regulated by individual state legislation. Each state's legislation follows a generally accepted code of practice, but differs in certain ways from one another. Table 1 shows a list of the relevant state legislation that regulates retirement villages in Australia.

Table 1: State Retirement Village Legislation

State	Legislation
Australian Capital Territory	Retirement Villages Industry Code of Practice
New South Wales	Retirement Villages Act 1999
Northern Territory	Retirement Villages Act 1995
Queensland	Retirement Villages Act 1999
South Australia	Retirement Villages Act 1987
Tasmania	Retirement Villages Act 2004
Victoria	Retirement Villages Act 1986
Western Australia	Retirement Villages Act 1992

As can be seen, the majority of the legislation was enacted during the mid-1980s to the late 1990s, mostly legislating what was commonly accepted industry norms. Significantly for the importance of this data, there have been substantial reforms of the legislation during the past decade, resulting in material changes in the way retirement villages are owned and managed. Some of these reforms are noted below.

New South Wales

The New South Wales based Retirement Villages Act 1999 was reformed in 2006 to enact a number of changes, including:

- Requiring operators to make a provision for capital maintenance out of recurrent charges,
- Allowing conditions under which operators can vary recurrent charges without the consent of the residents, and
- Providing for a “settling in” period under which a resident may cancel a contract.

The Act was further reformed in 2010 to:

- Refine the “settling in period to 90 days, with a market-based rent payable to the operator plus an administration fee of no more than $200,
- Allow residents to add or remove fixtures with the operator’s consent,
- Further reform the capital maintenance provision, and
- Reduce the time period for recurrent expenses to be charged to a resident once they have left the village from six months down to six weeks.

Queensland

The State of Queensland reformed its Retirement Villages Act 1999 in 2006 to, amongst other items:

- Increase the rights of residents when leaving a village,
- Recognise the rights of spouses and relatives of a resident, and
- Clarify the dates for the calculation of fees and entitlements upon exit.

Victoria

The State of Victoria altered its Retirement Villages Act 1986 in 2005 to reform particular items, including:

- Removing the operator's ability to require residents to use the operator as the real estate agent when selling their village property,
- Prohibiting operators from gaining the power of attorney for a village resident, and
- Limiting the length of time fees can be charged to a resident once they leave the village.

The factors altered during the above-mentioned reforms have the capacity to significantly alter both the investment decisions for retirement village operators and the consumption decisions for retirement village purchasers. It is therefore potentially of great value to study the pricing of retirement housing at the point in time where legislation had been enacted, but was yet to undergo significant reform. This research would provide a basis from which to compare the effects of subsequent changing market conditions.

1.3.3.2 Changing Retirement Housing Consumption Preferences

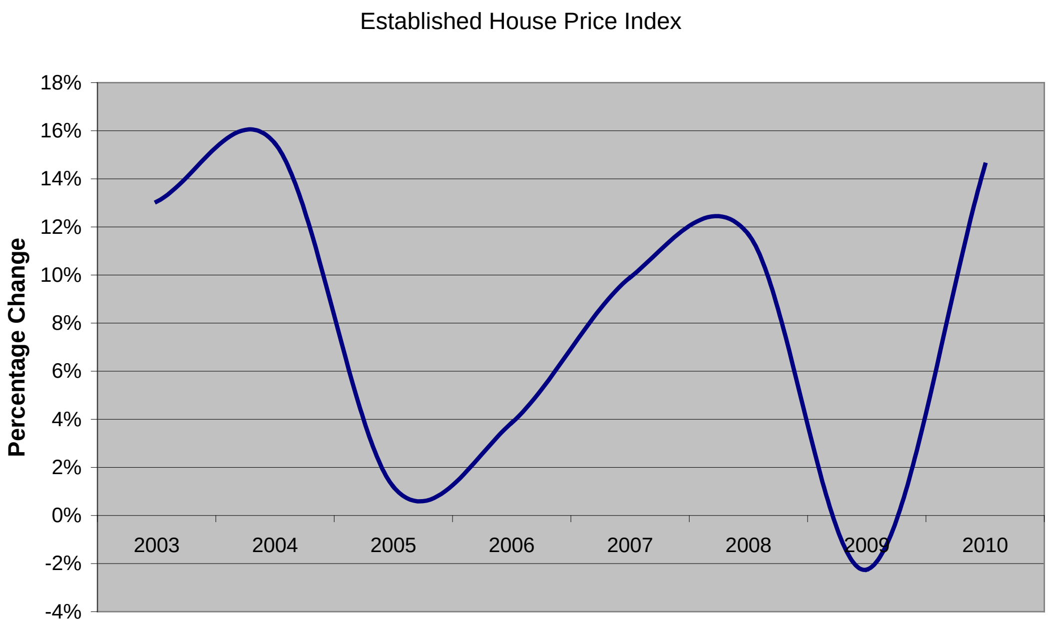
The Australian Bureau of Statistics estimated in 2006 that 4.35% of Australians aged 65 years and over lived within a retirement village. The recent report by McMullen and Sam (2008) estimated this figure to have climbed to 5.25% and projects future penetration rates of in excess of 8%. Indeed, there are areas of Australia exhibiting penetration rates in excess of 8%, with the local government area of Mandura in Western Australia estimated to house 18.7% of its citizens 65 and over in a retirement village (McMullen & Sam, 2008). As consumption preferences change so will the demand characteristics defining the purchase event, leading to alterations in the relationship between retirement housing attributes and price.

1.3.3.3 Residential Housing Price Instability

The first ten years of the new century has been marked by large movements in general residential property prices, as exhibited in Figure 3.

Such instability may result in spurious results in an econometric model estimating house prices.

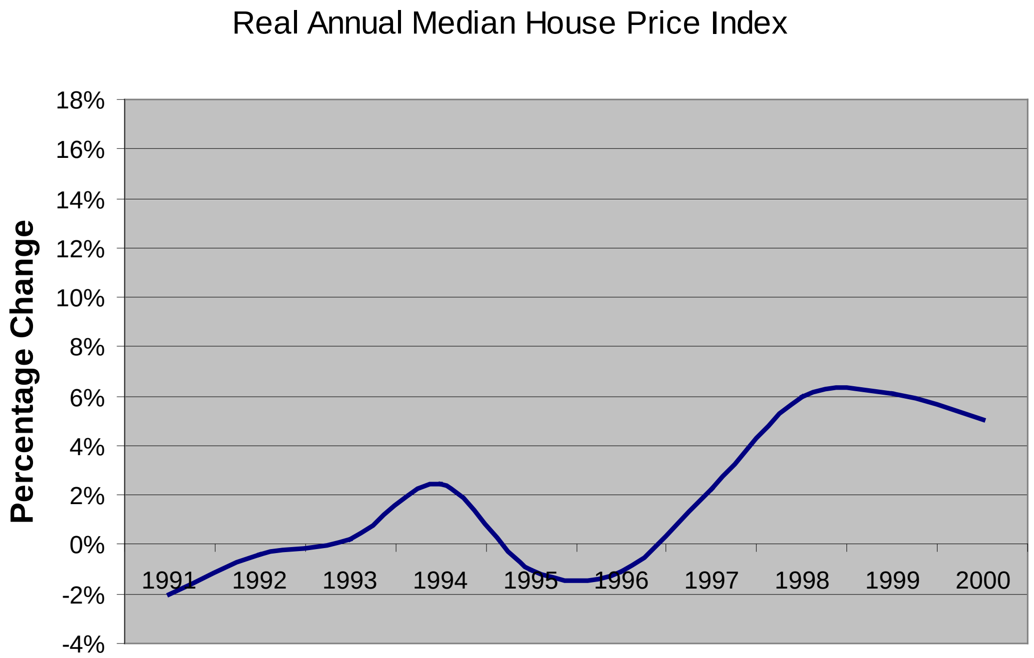
Figure 3: Residential House Price Movements – 2000s



Source: Australian Bureau of Statistics: 4102.0 Australian Social Trends, 2010

This instability is in stark contrast to a sustained period of stable and slightly increasing prices through the 1990s (see Figure 4). The sample data sourced in 2000 and 2001 provides an excellent opportunity to establish an econometric model to examine the relationship between residential housing attributes and prices at a time of relative stability. This model can then be extrapolated to other periods of economic stability and add interpretive power to subsequent research in the field.

Figure 4: Residential House Price Movements - 1990s



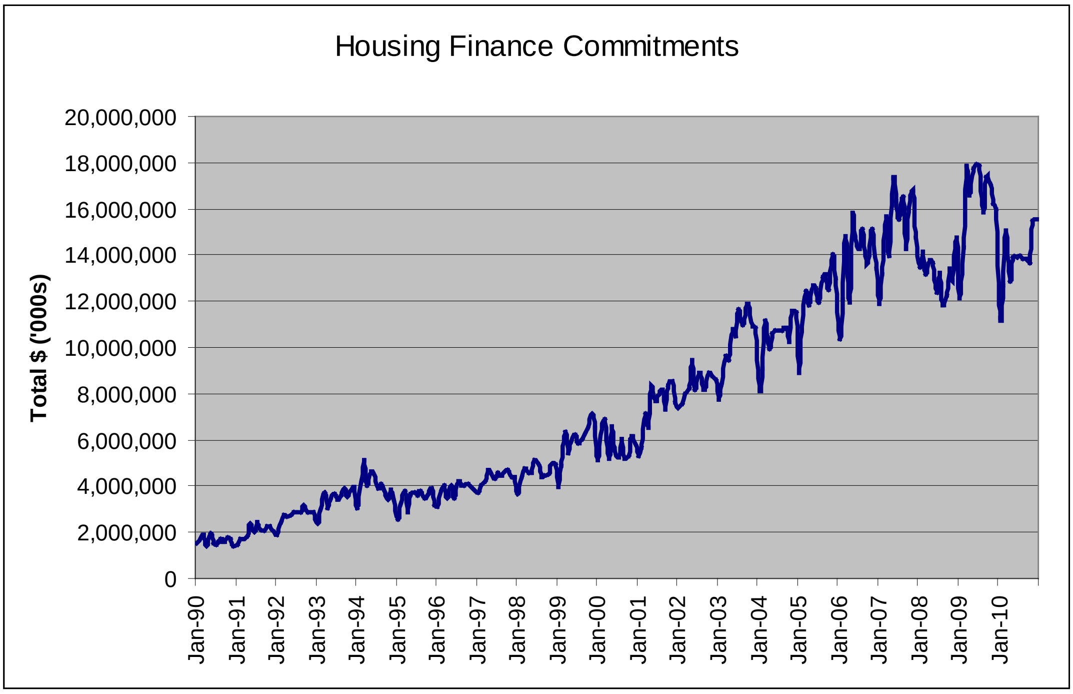
Source: (Abelson, et al., 2005)

1.3.3.4 Capital Market Shocks

The sustained economic growth Australia experienced after the recession of the early 1990s was mirrored in the capital markets, with equity markets showing consistently positive returns for the remainder of the decade. This was a period of general prosperity for Australians, with relatively stable financial conditions leading to buoyant capital markets.

The availability of bank credit for homeowners was increasing year after year during the 1990s, owing mainly to lower net interest margins resulting from increased competition post deregulation and sustained low inflation contributing to increased housing affordability. Housing debt increased by an average of 15% pa between the years of 1990 and 2007 before showing substantial instability as a result of the global financial crisis (see Figure 5). As previously discussed on page 15, bank credit availability is considered a macroeconomic influence on housing prices.

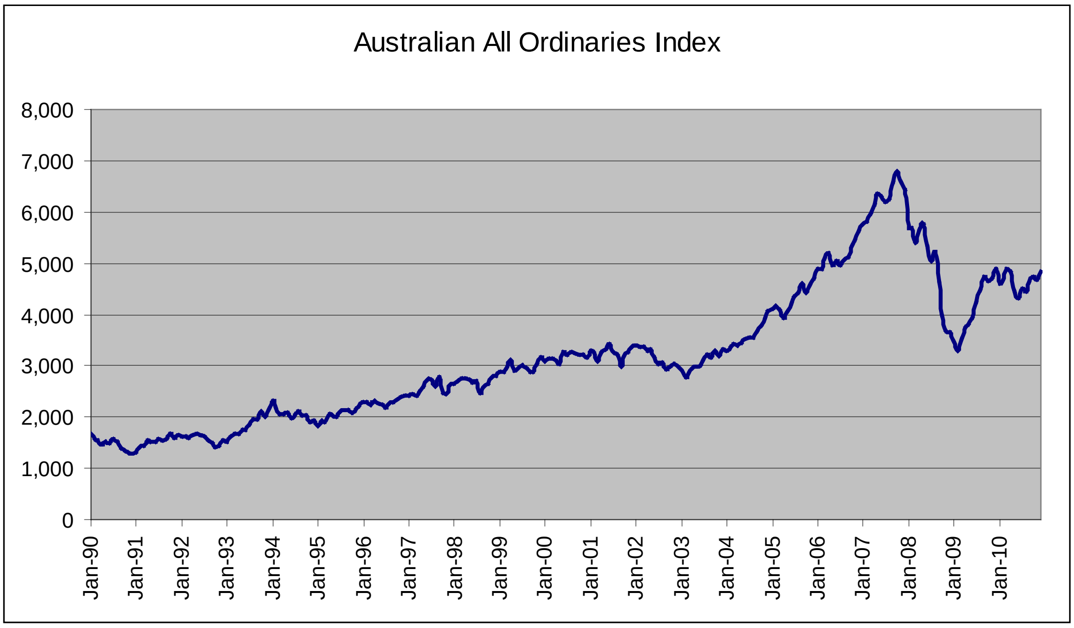
Figure 5: Housing Finance Commitments



Source: (Australian Bureau of Statistics, 2010)

This instability in the debt markets was mirrored in the equity markets, with a sustained period of boom through the 1990s and early 2000s followed by substantial volatility during the global financial crisis. This can be seen quite graphically in Figure 6 below. The volatility in the equity markets affected individuals' wealth: share ownership in Australia had risen since 1991 when just 15% of the population owned shares to be 40% in 2000 and 55% in 2005 (Australian Stock Exchange, 2009). This alteration in household wealth may well impact the price relationship modelled in this study.

Figure 6: All Ordinaries Index 1990-2010



Source: Australian Stock Exchange

1.3.3.5 Industry Taxation Changes

July 1st 2001 saw the introduction of The New Taxation System, with the Goods and Services Tax implemented to replace a range of existing taxes. Since that date the industry has been operating under a level of uncertainty about the GST implications for their business, both in the development and operation of the villages. Reviews to the GST's application to retirement villages have occurred (2004, 2006, 2007 and 2009 to name a few), and July 2010 saw a ruling on the treatment of GST when building and selling retirement villages that *"could potentially wipe billions off their values"* (Chong, 2010). The implementation of this most recent ruling should at least bring some certainty to the industry. This will allow for more accurate modelling of pricing relationships under a more stable taxation environment.

Other taxation changes have occurred in the past decade that may affect the pricing of retirement village units, at least from a supply side. These include changes in property tax applying to owners of retirement villages. In June 2006 the New South Wales state government removed the tax free threshold for land tax purposes (set at $352,000) as it applied to unit trusts, a corporate entity employed by many owners of retirement villages. This increased the annual costs of ownership, affecting the cost basis for retirement villages in general and therefore potentially having an effect on unit prices.

1.3.3.6 Summary of Available Data

There are two sources of data available for use in this research. The first is the data collected for Stimson's 2002 study while the second is data collected specifically for the purposes of this study.

Establishing a pricing model using data sourced for Stimson's 2002 study will be beneficial to future research for numerous reasons. The time period leading up to the data collection was characterised by relatively stable economic condition, allowing for extrapolation of the results of this study to other periods of relative economic stability. The past decade has seen significant volatility in residential housing prices which may provide for spurious results in a pricing model. The data is sourced from a point in time when the industry was about to undergo significant structural changes, as evidenced by alterations in the taxation regime surrounding the asset class and the legislation that regulates it.

There is no existing research on this topic. The issue of housing affordability for the ageing population will continue to grow in importance, and the opportunity for future research in the field is significant. A study of the pricing relationship at a time of relative stability prior to this time of substantial volatility in the industry may be valuable to future research endeavours both in terms of extrapolation to similar conditions and as a point of reference.

The results from the Stimson data can be compared with those from a current sample collected for the purposes of this dissertation. Together, the results may provide a greater context for understanding the relationship between medical proximity and retirement housing prices.

1.4 *Purpose of the Research*

We are at a point in time where the baby boomer generation are in the process of retiring. Developers are attempting to develop and build properties to meet the particular needs of this large pool of consumers, needs that have been observed to be changing the way in which retirement housing and related services are being delivered. Local councils are tasked with town planning and zoning decisions to enable the effective provision of retirement housing. Governments are challenged with formulating policies to enable the most effective delivery of care to the ageing population. By examining the impact of proximity to medical facilities in the price retirees are willing to pay for retirement-specific housing, this study has the potential to provide significant evidence-based data to decision-makers concerning these wide-ranging issues.

There is a call for the Australian government "to take ageing and housing into account in a wide range of policies influencing the built environment, incomes, housing and care." (Kendig & Bridge, 2007, p. 236). The government has implemented several programs to deliver that service, but it has been shown that a chronic shortage of carers is limiting the ability of these programs to effectively deliver the required levels of care. Despite these limitations, it is estimated approximately 610,000 older Australians are clients of one or more of the Home and Community Care packages.

Service-integrated housing, of which retirement villages are the predominant type, are an effective way of meeting the gap between the demand for residential care and the provision through governmental programs. It is estimated that approximately 130,000 residents live in service integrated housing, putting the category nearly at the same level as residential aged care (high and low care nursing homes and hostels) which has roughly 165,000 residents (Jones et al., 2010). Jones *et al.* call for the government to give greater recognition to this category of care provision in terms of policy and research, stating it receives far less attention than community care and residential aged care.

As far back as 1984 it was identified that the provision of health care services to the retired population was an area that may require assistance for retirement village residents on lower incomes who may not be able to afford the private provision of care services (Legge, 1984). Kendig and Gardener (1997) encourage linkages between housing and care provision.

The provision of health care services as a component of service-integrated housing can be delivered in one of three ways. A captive, in-house model can be employed where care providers become an integral component of the housing. An example may be a full-time nurse stationed at a retirement village. Alternatively, the operator of the service integrated housing can contract out the services, having subcontractors on call for residents of the retirement villages. A third option is to co-locate with care providers, allowing residents proximal access to the care that is needed. This last option leads us to the research problem addressed by this thesis.

1.5 *Organisation of the Thesis*

This thesis consists of five chapters. Chapter One highlights the background to this research, defines the category of real estate to be analysed, identifies the research problem, and indicates some contributions this research may make. Chapter Two provides a review of the literature, focusing on the theories relevant to pricing real estate. A gap in the research on the retirement segment of the residential real estate market is identified and the research hypotheses are summarised. Chapter Three presents the research design. The two samples are described, all variables utilised are identified, and the methodology used to test the hypotheses is outlined. Chapter Four presents the results. The dissertation is concluded with Chapter Five which offers a summary of the findings and discusses the weaknesses of the research. Implications for future research are identified, including a discussion of ways in which to improve the current study.

2 Chapter Two: Review of the Literature

The purpose of this chapter is to identify and detail the foundation theories supporting the conceptual model presented in this chapter. The model draws predominantly from literature from the discipline of economics, with support from the areas of gerontology and marketing. The chapter is split into two sections: 1) a review of the literature related to the pricing of individual attributes of residential housing, and 2) an introduction of the model that will be tested in the study.

Two theoretical bases are used to support the analytical framework used in this study. Hedonic pricing theory is introduced in Section 2.1.1 and forms the basis for the analysis. The application of hedonic pricing to proximal amenity and negative amenity in general is explored in some detail, followed by an examination of the theory's application to the pricing of medical proximity.

Due to the heterogeneous nature of medical facilities where the services offered by individual sites can vary from general family doctor-type services to the complete suite of advanced medical services offered in a hospital, the proposed model seeks to differentiate between the proximal effects of lower order and higher order medical facilities on the price of retirement housing. Elements of retail location theory are introduced in Section 2.1.2 to support a theoretical justification for the separation of medical facilities into lower order and higher order services.

2.1 *Foundation Theories*

2.1.1 Hedonic Price Theory

Hedonic Price Theory has been used extensively since the 1960s as the basis to price heterogeneous goods and to derive demand and supply functions for the characteristics contributing to the value of such goods. Based on Kelvin Lancaster's (1966) Preference Theory, the Hedonic Price Theory allows researchers to examine the effect attributes of a good have on the overall price of that good.

Lancaster expanded consumer theory from classical economics to provide a microeconomic foundation from which utility-generating characteristics of goods can be estimated and analysed. This is especially important in markets for relatively heterogeneous goods, where comparisons between alternate competing goods are difficult and therefore complicate the pricing function.

In the context of real estate, Hedonic Price Theory has formed the basis of examinations into a wide range of factors affecting real estate purchase decisions. In a comprehensive review of approximately 125 journal articles published in the field, Stacy Sirmans, David Macpherson and Emily Zietz identified the most commonly cited factors as falling into five main categories: structural, neighbourhood, location, contract conditions, and the time the value is observed (Sirmans et al., 2005, p. 10). This can be summarised in the following formula:

(2) $$V = f\ (S, N, L, C, T)$$

where

V = Value

S = structural characteristics

N = neighbourhood characteristics

L = location characteristics

C = contract conditions or characteristics

T = the time at which the value is observed

From this basic model specification studies can assess a wide range of characteristics that may affect house values. Table 2 shows the twenty characteristics most commonly included in hedonic studies on real estate.

More focused applications have examined a vast array of attributes, including the effect of air quality (Kim, 2003), scenic view (Bond et al., 2002; Pompe & Rinehart, 1995), home owner warranties (Salter et al., 2004), social housing projects (Funderberg & MacDonald, 2010), gated communities (Lacour-Little & Malpezzi, 2009), school zoning (Bogart & Cromwell, 2000) and racial segmentation (King & Mieszkowski, 1973) on the prices of residential real estate.

Table 2: Most Common HPM Characteristics

The Twenty Characteristics Appearing Most Often In Hedonic Pricing Studies				
Variable*	Appearances	# Times Positive	# Times Negative	# Times Not Significant
Lot Size	52	45	0	7
Ln Lot Size	12	9	0	3
Square Feet	69	62	4	3
Ln Square Feet	12	12	0	0
Brick	13	9	0	4
Age	78	7	63	8
# Storeys	13	4	7	2
# of Bathrooms	40	34	1	5
# of Rooms	14	10	1	3
Bedrooms	40	21	9	10
Full Baths	37	31	1	5
Fireplace	57	43	3	11
Air Conditioning	37	34	1	2
Basement	21	15	1	5
Garage Spaces	61	48	0	13
Deck	12	10	0	2
Pool	31	27	0	4
Distance	15	5	5	5
Time on Market	18	1	8	9
Time Trend	13	2	3	8
Note: Although some of these variables are the same and just measured differently, they are presented separately so readers can see how they are typically measured.				

Source: (Kim, 2003)

The process of running hedonic models to estimate housing prices can be split into two stages. The first stage is of Lancastrian derivation and is the estimation of the factors affecting house prices and their respective coefficients. The second stage uses Rosen's ideas and delves deeper into the independent variables, deriving structural supply and demand characteristics (Follain & Jimenez, 1985; Witte et al., 1979). It is the aim of this research to investigate the effect of location amenity on retirement-specific housing prices, not to analyse their respective supply and demand characteristics, and consequently a Lancastrian approach will be used. Future research may extend to an analysis of the independent variables themselves.

2.1.1.1 Hedonic Pricing Theory and Location

The theory examining the effect of location of property value is quite old. In 1826 Johann Heinrich von Thunen proffered a spatially-based economic theory of agricultural land rents (von Thunen, 1826). In an environment including a single central city and holding climate, topography, and fertility constant, land rents were theorised to decline as distance from the city centre increased, reflecting increased transportation costs incurred to deliver produce to the markets. The model was represented as follows:

$$R = Y(p - c) - YFm \quad (3)$$

where:

R = land rent

Y = yield per unit of land

p = market price per unit of commodity

c = production expenses per unit of commodity

F = freight rate

m = distance to market

The first known empirical piece utilising an hedonic approach to test von Thunen's theory is Haas' examination of farmland prices in Iowa (Haas, 1922). Using a sample of 160 properties, Haas examined the effect of distance from the city centre on price per acre of land in Blue Earth County, Minnesota, finding that price per acre decreased by 3.422 dollars for every mile the property was distant from the nearest city centre. Another early piece of research includes Wallace's investigation into Iowa farmland values (Wallace, 1926).

Since then, Hedonic Pricing Theory has been used to examine the relationship between real estate prices and other proximity-related drivers of utility. The drivers may reflect an amenity or negative amenity, leading to either a positive or negative impact on price respectively.

Distance is typically measured in one of two ways: in units of distance (e.g. feet, miles, metres, kilometres) or as a dummy variable indicating that the property is within a designated distance (e.g. 1 mile) of a particular amenity. The former allows for more detailed interpretation, while the latter provides for inferences about the general effect of proximity. Advances in technological capabilities have allowed distance to be further differentiated to allow for more detailed analysis. Satellite-based mapping applications have enabled the ready calculation of driving distances in addition to the traditionally used Euclidian distance, commonly referred to "as the crow flies".

2.1.1.2 Locational Variables Studied in the Literature

Consistent with the theme of a central business district deriving utility for real estate consumers, Frew and Jud (2003) determined a 1% increase in distance from the Portland (Washington, USA) central business district resulted in a 0.08% reduction in apartment values. Distance was measured in miles and included in logarithmic form. The analysis used information from a sample of 129 apartment properties that sold during the period of 1996 to 1999 and controlled for age, size, and neighbourhood amenity.[3]

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[3] Total community payroll and average salary were used as proxies for neighbourhood amenity.

Clark, et. al. (1997) examined the effect proximity to a nuclear power plant had on residential property prices. Distance was measured in miles. Utilising a sample of 7,694 property sales between 1991 and 1994 around two nuclear power plant sites in California, they determined a u-shaped distance gradient with the linear distance variable negative and the distance squared variable positive. The authors proposed this reflected an immediate proximal amenity in the form of employment coupled with the visual and perceptual disamenity. Given the size of the sample a wide range of control variables were incorporated into the model including structural (age, age squared, number of bedrooms, central air-conditioning, fireplace, number of bathrooms, size of the lot), neighbourhood (mean household income, racial mix, population density, distance from railway tracks, distance from an interstate highway, average commute time), and temporal (year of property sale transaction) attributes.

The proximity to train stations and railway lines has received particular attention in the field (Australian Bureau of Statistics, 2008b; H. Kendig & Neutze, 1999; Morris, et al., 2005; NATSEM, 2004). In a recent US study proximity to a train station was shown to be a source of positive amenity for residential real estate consumers, with every foot closer resulting in a 2.31 dollar premium in price (Hess & Almeida, 2007). The study was conducted in Buffalo, New York and included data on 7,357 properties. A study conducted by Portnov et al. (1997) on 926 houses in Haifa, Israel found an immediate disamenity evidenced by a 13% decrease in price within 50-100 metres of train tracks.

Darling's study into the benefits generated from the existence of urban water parks included an estimate of the effect the water park had on proximate real estate prices, measuring the distance from each property to the park in feet. Proximity was shown to have a significantly positive effect on the sale price of apartments and other multi-unit dwellings within 3,000 feet of the three water parks examined in California (Darling, 1973).

The effect of proximity to shoreline was researched by Brown and Pollakowski (1977) in their examination of 179 properties surrounding three lakes in the City of Seattle, Washington. Distance was measured in feet and used in a logarithmic form to allow for non-linearity of distance amenity (the effect of being 500 feet away compared to 1000 feet may differ from the difference of 9,500 and 10,000 feet). Proximity was found to significantly increase prices around all three lakes. Structural control variables were used (including age, living area, number of bathrooms, number of fireplaces) along with a neighbourhood control variable (a dummy variable indicating a view).

Continuing with the theme of water, Mahan et al. (2000) found residential real estate prices increase with proximity to wetlands. The study used data from 14,485 residential real estate sales in Multnomah County (near Portland, Oregon), an area with over 4,500 wetland habitats, between

June 1992 and May 1994. Control variables included structural (including age, number of bathrooms, swimming pool, lot size), location (area split into four geographic segments), and neighbourhood (including distance to CBD in log form, elevation, slope, log of the distance to the nearest industrial and commercial zones) attributes of the properties.

Song and Sohn (2007) found a positive effect in their analysis of proximity to retail facilities on residential real estate prices. The results were based on a sample of 795 property sales in the city of Hillsboro, North Carolina, in the year 2000 and controlled for attributes including structural (age, age squared, floor size, lot size), location (distance to a park, distance to a commercial store, distance to nearest CBD), and neighbourhood (racial mix, median income, population density, land use mix) characteristics. Proximity to retail facilities in this case was measured using a Retail Accessibility Index that the authors constructed using the following formula:

$$A_i = \sum_{i=1}^{n} \frac{R_j d_{ij}^{-\beta}}{\sum_{k=1}^{m} d_{kj}^{-\beta}} \qquad (4)$$

where A_i is the accessibility index score of household i to retail facilities, n is the number of retail stores, R_j is the retail store floor size in feet, d_{ij} is the distance to retail store j from household i, β is a distance decay parameter, and m is the number of households. The formula is often used by researchers in the retail marketing literature.

2.1.1.3 Spill-Over Effects of Locational Amenities

Recent literature has applied a natural experiment approach to the field, focusing on markets where the nature of a variable has changed. These circumstances allow researchers to identify the effect of the variable on house prices through a difference-in-difference specification of the hedonic price regression. This approach focuses on identifying the effect of a change in the location-based attribute of an amenity on the price of an individual house rather than using transactions of different houses in different locations relative to a fixed locational amenity to reveal the implicit price.

Examples of circumstances where the difference-in-difference approach can be used include where the boundaries of school zones change, the introduction of new forms of public transport such as a new railway station, and the introduction or removal of other sources of positive or negative amenity such as subsidised housing. In each of these cases the distance to a locational amenity may change for an individual house: the introduction of a new railway station may shorten the distance the distance to this kind of amenity, effectively providing a pre- and post-test scenario for researchers to use as the basis for a natural experiment.

In one such examination of the extension of two major lines of the London underground, Gibbons and Machin (2005) identified a positive effect of increased proximity to railroad stations on residential house prices. This positive effect was restricted to houses where the new railway station was placed within two kilometres of the subject house, with no significant effect found for houses where the distance to the new railway station exceeded two kilometres. Interestingly, the authors extended the implications of the research to imply a shadow price for walking time for London residents of approximately £1.60 per hour (in 2001 currency). This was estimated by computing the mean capitalised value of the price premium imparted by transport proximity and dividing it by an assumed average walking time to the railway station.

Public and subsidised housing projects have received attention from researchers attempting to provide assistance to policy-makers and other stakeholders about the broader implications of such projects. Prior to the mid-2000s there was little evidence focused on the externality effect of subsidised housing projects: prior research had focused predominantly on the benefits provided to the subsidised households themselves (Schwartz et al., 2006). The difference-in-difference approach has enabled researchers to target the external effects of the placement of new subsidised housing projects.

Richard Funderburg and Heather MacDonald used this natural experiment approach to examine the impacts on surrounding housing prices of new low-income housing tax credit projects in the US state of Iowa (Funderberg & MacDonald, 2010). Their study found that the type of tenants planned for the housing project moderated the impact on external property valuations. Focusing on rates of value appreciation, the study identified a short-term negative impact for houses in proximity of a housing project consisting predominantly of low-rise family projects, whereas the effects of projects catering to the elderly were negligible.

Prior research into subsidised housing found significant external benefits that were sustained for up to five years after the completion of the project. In their study of city-assisted housing projects completed in New York City between 1987 and 2000, Schwartz et al. (2006) found significantly positive effects on the prices of houses surrounding new subsidised housing projects within a 2,000 foot ring. The authors suggest this is due partly to the provision of amenity and also partly to the removal of negative amenity. This removal of negative amenity is claimed to be attributable to the new projects replacing an existing area of an undesirable nature.

This paper was a follow-up to an earlier paper by three of the same authors who also found positive effects of subsidised housing projects (Ellen et al., 2001). The 2001 paper stratified surrounding houses in three distinct groups: those within 500 feet, those between 500 and 1,000 feet, and those between 1,000 and 2,000 feet. Surrounding house prices were seen to improve relative to non-proximate houses outside the rings, with the effect occurring earlier in the 500 foot ring and later in the 1,000 to 2,000 foot ring. The authors put forward that the possible explanation for this price impact was threefold: the removal of negative amenity from the marketplace (the sites on which the subsidised housing projects were developed were typically of an undesirable nature), the injection of relatively higher-income residents into the neighbourhood, or given that these projects were for owner-occupied housing the increased ownership rate may improve the general amenity of the neighbourhood (stability, upkeep, community activism) and therefore impact surrounding prices.

The difference-in-difference technique has been applied to examine the impact of changes in school zone boundaries. Early work (Gill, 1983; Judd & Watts, 1981) established a relationship between school characteristics and house prices. Using the difference-in-difference approach, Bogart and Cromwell (2000) identified a disruption in neighbourhood schools resulted in a 9.9% reduction in house values. The study used house sales price data between 1983 and 1984 from the town of Shaker Heights, Ohio and attributed the impact to the loss of a school from a neighbourhood zone, the provision of additional transportation options, a change in the racial composition of a school due to the rezoning.

2.1.1.4 Potential for Bias in Hedonic Pricing Models

The hedonic pricing model can potentially suffer from biased estimators due to a range of factors, including omitted and poorly measured variables. As Epple states *"the hedonic price equation will be estimable by* *ordinary least squares if there are no product characteristics measured with error and no unmeasured product characteristics"* (Epple, 1987, p77).

For studies looking at location-based variables it is imperative to be as accurate as possible with the measurement of the distances as well as controlling for unobserved variables. Advances in mapping software are assisting in the measurement issue. Past works have often used proximal rings to measure distance. For example, Gibbons and Machin used a two kilometre ring to indicate proximity to a railway station when valuing rail access in London: those inside the ring were considered to be proximal, while those outside were not (Gibbons & Machin, 2005). This method is also common when looking at the effect of subsidised housing. For example a 2,000 foot radius was used by Santiago et al. to examine the proximal effects of such programs in Denver, Colorado (Santiago et al., 2001).

GIS-based software such as ArcGIS, and indeed Google Maps, have made accurate measurement more available by using latitude and longitude markers to define points of interest. Google Maps allows researchers to compliment the traditional Euclidean distance with driving distances based on road mapping technology, broadening the scope of the measurement of proximity to arguably more accurately reflect actual proximity versus perceived proximity.

When it comes to unobserved variable bias, it is noted that differences in neighbourhood-level fixed effects can cause differences in proximal relationships (Michaels & Smith, 1990). A common method used to account for neighbourhood heterogeneity is to include a proxy identifying neighbourhood effects. Different proxies can be as simple as community district dummy variables (Schwartz et al., 2003) that reflect postcodes or some similar identifier of a submarket, or they can refer to census tract fixed effects such as income levels, crime rates, minority population, home ownership rates, and population growth rates (L. Freeman & Botein, 2002; Funderberg & MacDonald, 2010; Galster et al., 1999; Michaels & Smith, 1990). Cutter and DeWoody (2010) argue that the median house price for the geographic submarket should be used to account for all unobserved neighbourhood variables.

2.1.1.5 Contemporary Views on Locational Amenities

Current research has focused on issues of a topical and pressing nature. For example, several papers in highly ranked journals have examined the effects of house foreclosures on surrounding property prices, responding to the recent proliferation of mortgagee-in-possession sales in the United States. Harding et al. (2009) show an approximate 1% decline in property prices within 300 feet of a foreclosed home while Lin et al. (2002) show a significantly negative spill-over effect on prices as high as 8.7% within 0.9km of the site, and within five years of the date, of the foreclosure.

In Australia, research incorporating location is quite scarce. Indeed, a recent study modelling house prices in Melbourne, Sydney and Brisbane used postcode as a proxy for location-based amenities: *“the postcode can be thought of as a proxy for a range of characteristics associated with the houses’ location, such as the average amenities of the neighbourhood (distance from schools, the beach, city, services and so forth)”* (Hansen, 2009, p. 138).

Recent research suggests purchasers of residential real estate consider both proximal and distal sources of location-based amenity in particular variables. Kiel and Zabel (2008) show that metropolitan, town and immediate street levels of a particular variable can all significantly affect price and should be included in hedonic pricing models. This is an important consideration for medical amenity, given the fact that different forms of medical services may be delivered at different distances from a particular property.

2.1.1.6 Hedonic Pricing Theory and Medical Proximity

An extensive search of the hundreds of studies utilising Hedonic Price Theory to price proximity amenity has revealed the absence of any studies examining medical facilities in particular. A summary of neighbourhood characteristics studied as reported by Sirmans *et al.* (2005) is shown in Table 3.

Table 3: Summary of Neighbourhood Characteristics

Environmental Neighbourhood and Locational Variables				
		Number of Times:		
Variable	Appearances	Positive	Negative	Insignificant
Location	9	7	2	0
Good Location	1	0	0	1
Golf Course	9	9	0	0
Located on Alley Way	3	0	1	2
On 2-Way Street	1	1	0	0
Busy Street	2	0	0	2
Interstate	3	0	3	0
Arterial Road	1	0	0	1
High Traffic Area	3	0	2	1
In City	1	1	0	0
Close	3	0	0	3
Distance	15	5	5	5
Distance Squared	2	1	1	0
Travel Time to Work	1	0	1	0
Hwy Time to CBD	4	2	2	0
Distance from Waste	4	2	1	1
Distance to School	1	1	0	0
Distance to Landfill	1	1	0	0
Metro within ¼ Mile	1	0	1	0
½ Mile to Hwy Interchange	1	0	0	1
½ to 1 mile to Hwy Interchange	1	0	0	1
1-2 Miles to Hwy Interchange	1	1	0	0
2-3 Miles to Hwy Interchange	1	1	0	0
¼ Mile to Metro Station	1	0	1	0
¼ to ½ Mile to Station	1	0	0	1
½ to 1 Mile to Station	1	0	0	1
1-2 Miles to Station	1	1	0	0
2-3 Miles to Station	1	1	0	0

Continued over page…

Table 3 Continued… Environmental Neighbourhood and Locational Variables				
	Number of Times:			
Variable	Appearances	Positive	Negative	Insignificant
Railroads	1	0	1	0
Train Station	1	1	0	0
Stream	1	0	0	1
Bay	1	1	0	0
Crime	7	1	4	2
Bad Crime Level	1	0	0	1
Murder rate	1	0	1	0
Correctional Facility	1	0	0	1
Abandoned Buildings in Area	1	0	1	0
# Houses in Neighbourhood Boarded Up	1	0	1	0
Neighbourhood Density	4	1	1	2
Neighbourhood Noise	1	0	0	1
Noise Control Level	1	0	1	0
Bad Trash in Area	1	0	0	1
Neighbourhood Odour Bad	1	0	0	1
Trees	6	6	0	0
R1 Zoning	2	2	0	0
R2 Zoning	2	2	0	0
R3 Zoning	2	0	0	2
Lot Density	1	1	0	0
Baptist	1	0	1	0
Catholic	1	0	1	0
Church of Jesus Christ of Latter Day Saints	1	1	0	0
Distance to Group Home	1	0	1	0

Source: (Sirmans, et al., 2005)

The distance to the nearest hospital has been included in a limited number of studies, mainly looking at the general effect of retail proximity on residential housing prices. In the only study found to identify distance to hospital as a stand-alone effect, Matthews and Turnbull (2007) examined the effect of neighbourhood street layout on residential property prices. To control for other causes of neighbourhood amenity, the authors utilised distance to the nearest hospital as a component of general retail proximity and found mixed results. The effect in one section of the study area was significantly positive for straight line distance and significantly negative for straight line distance squared, while results were insignificant in the other section of the study area.

It is this dearth of research that is the major impetus behind this dissertation. Proximity to medical facilities has been shown in the field of gerontology to be a major preference for purchasers of retirement specific housing (see Section 2.1.1.6 on page 71), and population trends dictate a significant increase in the need for retirement specific real estate. There is therefore cause for us to examine the effect of proximity to medical facilities on the price a purchaser is willing to pay for this burgeoning category of real estate.

2.1.2 Retail Location Theory

Different types of medical facilities deliver different levels of medical services. At one extreme is the full-service hospital, offering an emergency department along with a full suite of medical service. At the other is the single doctor office model, often referred to as the local doctor or the general practitioner, delivering every day medical services and referring more specialised needs on to other facilities. In between you have a range of so called medical centres that contain doctors and other allied health professionals that may include psychologists, podiatrists, physiotherapists, dermatologists, and the like. These centres offer a wider range of services than the single doctor model, but nowhere near the range and specialisation offered at a full-service hospital.

Consequently, when examining the impact of proximity to medical facilities on the price of retirement housing it is important to consider the fact that different categories of medical facilities deliver different levels of medical services which may impact the particular facility's effect on surrounding housing prices. The theoretical justification for this point of view comes from the field of marketing and is generically known as retail location theory.

Modern retail location theory is a culmination of scholarly thought stemming from four seminal location concepts: (1) "central place" theory (Christaller, 1933), (2) the principal of "minimum differentiation" (Hotelling, 1929), (3) "spatial interaction" theory (Reilly, 1929, 1931), and (4) "bid rent" theory (Haig, 1927). The four theories are deductive theories based on a set of underlying assumptions including rational, utility maximising individuals operating in freely competitive environments that describe spatial patterns related to retailing activity. Collectively the theories attempt to identify the optimal location for a retailing firm with respect to demand for the firm's goods or services.

The distance a consumer will elect to travel in order to consume a good or service is a component of these four theories. A recent meta-analysis of forty-five previous empirical studies into retail patronage identified convenient location as a positive influence on consumer retailing choice (Pan & Zinkhan, 2006). Location has also been identified as having a positive influence on service satisfaction (Berry et al. 2002). Malhotra's (2004) threshold model of store choice includes convenience of location as a key determinant. We may therefore assume that convenience to services of importance to purchasers of retirement housing, for example health care services, may be significant determinants of price.

2.1.2.1 Central Place Theory

Based on the work by Christaller (1933) and Losch (1940), Central Place Theory states that demand for a good declines with increased distance from its point-of-supply. The point at which demand declines to zero denoted the boundary of the marketable area of the good, referred to as its "range". Within the range a certain level of demand (the "threshold") must exist before the good will be supplied. In this theory the extent of a good's range is related to its price and frequency of purchase. Expensive, infrequently purchased goods such as motor vehicles are known as higher order goods and have higher thresholds and larger ranges than inexpensive, frequently purchased (lower order) goods such as milk and bread. Consequently, in any given market area there will be relatively few suppliers of higher order goods and conversely many suppliers of lower order goods, all equally spaced from competing points-of-supply.

The assumptions underpinning Central Place Theory include a uniform distribution of rational, utility maximising consumers with perfect information (and symmetry of that information) and equal purchasing power transacting on single goods on distinct shopping trips to the nearest supplier of the desired good, with travel assumed to be equally priced and easy in all directions. Subsequent empirical studies found scant support for the theory in its pure form. Specifically, the assumption of single purpose trips to the nearest shopping centre has received critical analysis (OECD, 1996). In terms of retail activity, consumers have been shown to exhibit multi-purpose shopping trip behaviour, combining several different consumption activities into a single shopping trip (Gardner, 1994; Manicaros & Stimson, 1999). Consequently, the assumptions have been relaxed in an effort to make the empirical models more flexible, with Berry and Garrison (1958a, 1958b) allowing for uneven population distribution and purchasing power.

Berry and Garrison's early work was the beginning of further advances in the theory, with even their work coming under scrutiny. Other scholars explored consumer differences such as ethnicity (Pred, 1963) and income

(Davies, 1972). Additional expansions of the theory include the allowance of multipurpose shopping trips (Craig et al.,1984) and the observance of hierarchical market centres rather than uniform spacing: Scott (1970) claimed that empirical evidence suggested a *“stepped hierarchical spatial arrangement”* (p.14) while Hans Carol (1960) derived a hierarchical classification of intra-market centres. Carol identified distinct submarkets, each with its own central marketplace. In a US-context, the sub marketplaces were defined as: local centre, neighbourhood centre, community centre, regional centre, metropolitan centre and super metropolitan centre. When combined with earlier work in the field of marketing by Garrison (1959) this hierarchy was collapsed into three major centres within a city:

- Central business district
- Regional business district
- Neighbourhood business district

Carol studied the city of Zurich in Switzerland and noted a wider range of goods and services offered at higher prices in the central versus the regional and subsequently neighbourhood centres. He categorised each area according to the amount and variety of goods and services offered and the geographic range of the marketplace. The central business district offered more goods and services at higher prices to a greater range of consumers than the regional centre, which in turn offered more goods and services at higher prices to a greater range of consumers than the neighbourhood centre.

Carol's research indicates that the goods and services offered for consumption at the central business district derive greater utility for consumers, as consumers must endure higher costs, in both transportation costs and direct prices, in order to consume them. This concept is reinforced by a seminal piece of research by Berry (1963) showing a relationship between the location and function of shopping centres and variations in land rents. It is important to note that many aspects of this work are outdated and have been advanced through more recent research, however the fundamental concepts of proximity deriving utility remain. This indicates proximity to retail facilities is of positive economic utility to purchasers of property.

2.1.2.2 Principle of Minimum Differentiation

Extending Central Place Theory which states that all types of economic activity desire the central location in a given market, the principle of minimum differentiation recognises that not all economic activities depend upon access to the entire market and therefore do not necessarily covet the market's central position. In fact, proximity to complementary economic activities can be more desirable, as evidenced by the grouping of motor vehicle dealerships, restaurants and cafes within city environs. This is sometimes referred to as special accessibility and builds off Hotelling's (1929) principal of minimum differentiation.

Under the assumptions of inelastic demand from utility maximising, uniformly distributed consumers choosing between alternatives solely on price, exposed to fixed transportation costs, and having only two companies selling identical products from which to choose, Hotelling showed that price increases would not increase a company's profit. Rather, the company could only increase profit if it could freely relocate to immediately adjacent its competitor on the "long" side of the market, thus increasing sales volume and potential profit. If the competitor was free to relocate also, a "leapfrogging" action would ensue resulting in the co-location of both companies at the centre of the market. This "clustering" of like services has received empirical confirmation in a wide range of countries among different types of retailing (Brown, 1999). Furthermore, the instance of clustering appears to be related to the order of the good (higher order goods such as motor vehicles and jewellers tend to exhibit more clustering tendencies).

2.1.2.3 Spatial Interaction Theory

Spatial Interaction Theory extends the views of Central Place Theory, incorporating consumers' trade-off between the attractiveness of competing shopping alternatives and the deterrence of the relative distances to travel to each. A consumer may choose to shop at a more distant shopping location due to its greater retail attractiveness, or conversely shop at a closer retail location despite its lesser retail attractiveness.

This theory was first operationalised in the field of marketing by William J. Reilly (Reilly, 1929, 1931) and is known as Reilly's Law of Retail Gravitation. The original model considered the situation of two competing cities drawing trade from a town in between the two. Using population as a proxy for retail attractiveness and distance as a proxy for the deterrence of travel, Reilly stated that each town would draw trade "approximately in direct proportion to the populations of the two cities and in inverse proportion to the square of the distance of these two cities to the intermediate town," as shown in the following formula.

$$\frac{B_a}{B_b} = \left(\frac{P_a}{P_b}\right)^N \left(\frac{D_a}{D_b}\right)^n \qquad (1)$$

In the formula, B represents business from an intermediate town to cities a and b, P represents the population of the cities, D represents the distance from the intermediate town to the cities and N and n represent the sensitivity of the business to the populations and the distances. Reilly shows support for N having a value of 1 and n equating to 2 when referring to shopping goods.

Under Reilly's law, and holding population constant, increasing distance to a city will reduce its retail attractiveness for the consumer. Reilly was careful to bound his law as applicable only to shopping goods, with the 1929 work referring only to the state of Texas, while the 1931 work included additional analysis that suggested generalisability for the entire United States.

Subsequent research has questioned the veracity of the population and distance variables in explaining empirical evidence (Carrothers, 1956; Huff, 1962). Consequently they have been supplanted by variables considered to be more appropriate proxies of attractiveness and deterrence such as retail floor space (Vorhees, 1957) and travel time (Brunner & Mason, 1968). Further, the application of the law has been extended to a wide range of different types of goods and services, including residential aged care (Roberts, 1995) and hospital services (Greene, 2003).

There have been four major developments in Reilly's law as shown in Table 4. Paul Converse conducted studies to determine the point at which a consumer is indifferent as to which city to travel to in order to shop, referred to as the breaking point distance and represented as equation (2) (Converse, 1948). He also derived an equation (3) that would determine the proportion of trade that would be held by the "home" town as opposed to the proportion lost to the outside town, incorporating what is known as the "inertia factor."

David Huff used shopping centre size and travel time as measures of attraction and deterrence, while incorporating the ability for the model to accommodate multiple shopping centre locations (Huff, 1964). This is expressed in equation (4) where P_{ab} is the probability of a consumer at point a travelling to a shopping centre at point b, T_{ab} is the time taken to travel from a to b, S_b is the size of the shopping centre at point b in square feet, and consistent with the original gravity model, n refers to an empirically derived sensitivity factor (higher order goods would be expected to have a higher sensitivity factor than lower order goods: consumers will spend more time shopping for a higher order good). Huff's extension has itself received refinement to account for particular attributes creating utility such as the presence a Cineplex (Ooi & Sim, 2007) and overall retail mix (Gerbich, 1998) The final extension of the model allows for multiple measures of attractiveness and deterrence and is shown in equation (5) (Black, 1987).

Table 4: Extensions of Reilly's Law

TABLE Evolution of the Gravity Model		
Equation	Year	Description
(1) $(B_a/B_b) = (P_a/P_b)^N (D_b/D_a)^n$	1929	The general form of the "law" as first proposed by Reilly.
(2) $BPD = (D_{a-b}) / [1+(P_a/P_b)^{.5}]$	1948	A mathematical restatement of Reilly's "law" determining "Breaking Point Distance" between competing towns, a and b (Converse).
(3) $(B_a/B_b) = (P_a/P_b)\ (4/d)^2$	1948	Converse introduces the "inertia factor" in this form which allows for the determination of trade shares between towns a and b.
(4) $p_{ab} = (S_b/T_{ab}^n) / (\sum_{b=1}^{m} S_b/T_{ab}^n)$	1964	Huff uses shopping center size as a measure of attraction and travel time as a deterrence measure in a model which determines the likelihood of travel from a to shopping center b, considering m alternative centers.
(5) $p_{ab} = \dfrac{(\pi A_{ab}^N * \pi D_{ab}^n)}{(\sum_{k=1}^{m} \pi A_{abk}^N * \pi D_{abk}^n)}$	1985	A multiplicative interaction model reflecting multiple measures of attraction (A) and deterrence (D) allowing probabilities to be computed as above (Black 1987).

Source: (Babin et al., 1991, p. 167)

2.1.2.4 Bid Rent Theory

In a marketplace where travel may be equally easy in all directions, Bid Rent Theory, as devised by Robert Haig, states the optimal location for trade is in the centre, where accessibility is greatest and average travel costs lowest (Haig, 1927). Given a single most highly-desirable location for economic trade, agents with differing uses for the land will bid competitively in an economically rational manner by means of the rent they will pay for the land. In the long run, this process will ensure that the land is put to its highest and best use.

William Alonso built on Haig's work to develop his general land use model. Alonso's model assumed the perfect market conditions of full and free information, uniform geography and population, rational, and utility maximising buyers and sellers who can travel at uniform cost. Businesses are found to be willing to pay the most for location with the amount they are willing to pay dropping steeply with increased distance from the market centre, followed by residential and agricultural land uses (Alonso, 1960, 1964). The result is a city centre consisting of businesses surrounded by concentric circles of residential land use and finally agricultural land use.

Haig's initial model has been extended to include submarkets within each market trade area. Scott (1970) argued that the bid rent model would hold true for different categories of retailers within a shopping district, with department stores toward the centre and lower order retailers such as grocery stores on the outer edge. Empirically, the concentric circle formation appears to be distorted by market imperfections such as differential accessibility due to the relatively fixed nature of transport networks, governmentally-imposed zoning restrictions, and physical barriers such as rivers and mountains.

The model assumes a smooth gradient of land use bidders, ordered from those who are willing to bid the highest in terms of rent for the most desirable location to those willing to bid the least. It also operates at a moment in time, not considering the temporal effects on land use decisions such as city growth and expansion. Notwithstanding these limitations, when it comes to empirical analysis, the Bid Rent Theory has been shown to reflect to a reasonable degree what occurs in reality (Ball, 1985; Johnston, 1977).

2.1.2.5 Summary of Retail Location Theory

Retail location theory states demand for a good or service will decline with distance from its point of supply, consistent with the increased costs (including direct transportation costs and indirect costs such as increased time) incurred by the consumer in order to consume the good or service. This demand can be broadly delineated along a continuum into higher order and lower order goods and services. Higher order goods and services are purchased less often at higher prices and draw consumers from a wider geographic range, requiring a larger number of consumers to be viable. Lower order goods and services are purchased more often at lower prices, requiring a much smaller number of consumers to be viable.

Higher order goods and services derive more utility for consumers, as they must overcome greater costs, both direct and indirect, in order to consume. Similarly, retailers will pay a premium to be located at the central place in the market, as the central location will give them access to the greatest number of potential consumers.

Within a given market there exists a hierarchy of submarkets, each with its own central marketplace. There will be few suppliers of higher order goods located in a few central business districts within a large city, while there will be numerous neighbourhood business districts offering predominantly lower order goods to a relatively small geographic range of potential consumers.

If it can be shown that the retail facilities are significant drivers of utility for consumers of residential real estate, the inverse will hold true and a plot of real estate that is closer to the retail facility will be more attractive for the consumer, resulting in a higher rent paid for the real estate. Hedonic Price Theory has been used extensively to identify the effect proximity to causes of amenity or negative amenity for purchasers of residential real estate has on residential real estate prices. Hedonic Price Theory extends Retail Location Theory into the domains of economics and finance, providing a means to identify the price a consumer will pay for reduced distance to the supply of a good or service that derives utility for the consumer.

This dissertation intends to develop a model to test the effect of proximity to medical facilities on retirement specific housing choice. Particularly, it will utilise Hedonic Price Theory to examine the effect of proximity to different categories of medical facilities on retirement housing prices. Following the work of Carol (1960) and Garrison (1959), it will be important to differentiate the type of medical facility according to whether it is higher order or lower in nature.

2.1.2.6 Retail Location Theory and Medical Proximity

The availability of medical services has been shown to be a higher-order service as it provides *"more critical, time-sensitive services than other retail and service functions"* (Song & Sohn, 2007). The reasons for proximity to medical facilities being a strong driver of utility for retirees is based on matters of physical well-being, with research showing a link between increased distance from a hospital and rates of mortality and inpatient episodes. In a study of mortality in emergency situations in general, a ten kilometre increase in straight line distance from a hospital was associated with a 1% increase in mortality rates (Nicholl et al., 2007). Jones and Bentham (1997) linked increased distance from a hospital with higher mortality rates among asthma sufferers, while Haynes et al. (1999) extended the field of study to in-patient episodes and showed reduced distance to both hospitals and the patients' local general practitioner to have an effect on reduced acute, psychiatric and geriatric episodes.

Logically one would assume that proximity to medical facilities would therefore be desirous for a purchaser of retirement specific housing. Studies have examined preferences for a range of attributes of retirement housing (Duncombe, et al., 2001; Gibler, et al., 1998; Lucco, 1987; Toseland & Rasch, 1978). Healthcare services consistently appear as a major preference for purchasers of retirement housing with studies showing failing heath to be a major cause of a resident's decision to choose to relocate into retirement specific housing (Hunt, 1991; Hunt & Gunter-Hunt, 1986; Merrill & Hunt, 1990). Merrill and Hunt's (1990) study identified healthcare options along with transportation options as the most desirable neighbourhood characteristic of a retirement housing community. Gibler, et. al. (1998) surveyed 1,463 US residents aged 55 years and over, finding 26% planning to move into retirement specific housing. Of those, 65% stated access to medical facilities was an important characteristic in housing choice, specifically a location near a hospital (57%). A 1990 study of residents aged 65-74 years in over 3,000 US counties identified hospital services as a positive influence on the attractiveness of a retirement location (Duncombe, et al., 2001).

Consistent with consumer preferences, there is a general trend in communities of retirement specific housing to provide supportive services such as access to medical facilities (Dobkin, 1992; Parr & Behncke, 1989). There is a call for a greater understanding of the preferences of elderly consumers of real estate in order to more effectively develop and offer a product that is in line with the consumers' wants (Gibler et al., 1997). Specifically, Regnier and Gelwicks (1981, p. 58) state *"health services are … highly valued and should be a major consideration in any building program"*.

Consistent with Bid Rent Theory, locating retirement specific housing closer to medical services will cost a developer more in terms of land acquisition costs. The extant literature suggests retirement housing consumers would prefer proximity to medical services. To date there has not been a study that has examined if those preferences translate into a willingness to pay more for increased proximity. Hedonic Price Theory allows an examination of the effect of proximity to medical services on retirement specific housing prices.

2.2 *Research Gap*

The use of hedonic pricing theory to examine the attributes that contribute to the price of residential housing is well established. The generalised model considers price to be a function of a range of structural, neighbourhood, locational, contractual and temporal factors. A considerable body of research has developed an understanding of the particular attributes that fit into this model for residential housing in general, as discussed in the preceding sections.

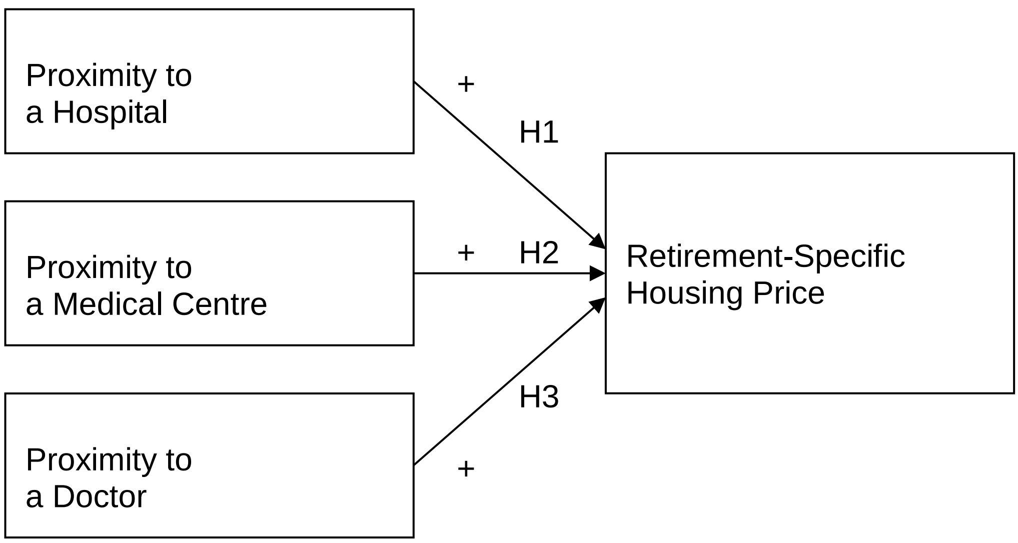
The existing research has acknowledged that these attributes might alter for housing that is designed for a particular sub-group of residential housing purchaser, and has explored examples such as manufactured homes (Vandeford et al., 2005), apartments (Jud et al., 1996; Valente et al., 2005) and sustainable housing (Mandell & Wilhelmsson, 2011).

Despite significant evidence suggesting differences in set of desirable attributes for retirement housing compared to general residential housing (Duncombe, et al., 2001), and calls for research to examine these differences (Skladzien & O'Dwyer, 2009), a gap exists in the research on the moderating effect of retirement-specific housing factors on the pricing model for residential housing. This thesis attempts to contribute to our knowledge in this area by examining location-based attributes of retirement housing.

2.3 *Model and Hypotheses*

To examine the effect of medical services proximity on retirement housing prices the model as depicted in Figure 7 is proposed. Consistent with Central Place Theory, the dissertation will examine the effects on the price of retirement-specific housing of medical services of different orders: hospitals are considered a higher-order service, a general practitioner's office is considered a lower-order service, and medical centres where there is a collection of doctors and other allied health professionals (which may include physiotherapists, psychologists, pathology clinics, etc.) are considered to fall somewhere in between the other two. Following the literature from the field of gerontology, the relationships in all three cases are expected to be positive.

Figure 7: Research Model



2.3.1 Hypotheses

H1: Proximity to a hospital will significantly influence retirement-specific housing prices

H2: Proximity to a medical centre will significantly influence retirement-specific housing prices

H3: Proximity to a general practitioner will significantly influence retirement-specific housing prices

3 Chapter Three: Methodology

The research depicts the hypothesised relationship between the price of a retirement-specific residential property and its proximity to three providers of medical services: a hospital, a medical centre and a general practitioner. Chapter Three outlines the methodology proposed to test this model. The sample data and collection processes are described as are the variables and methods used to test the models, and the regression models used to test the hypotheses are identified.

3.1 *Research Design*

This is an observational study, relying on information collected in Australia. The population can be considered to be any residential housing property whose target consumer is of at or near retirement age. Data are collected on the two major categories of readily-identifiable retirement housing: the retirement village unit and over-50s lifestyle village units. Each is collected at different times in a different manner, and will therefore be presented as two distinct studies.

The first study draws from data collected in 2001 through two survey instruments on the attributes and prices of retirement village units all over Australia. In 2008 there were in excess of 100,000 units in 1,756 registered retirement villages (McMullen & Sam, 2008). The second study draws from a combination of a proprietary database of transactional data of over-50s lifestyle villages in the cities of Brisbane, Logan, Redland and Gold Coast in the South East corner of the state of Queensland and observable data from multiple public sources related to those properties. Due to the fact that these villages are not required to be registered with any central body there is limited information on the scope of these developments. There are twenty-eight such developments in the subject region comprising 6,166 individual units.[4]

The proprietary database was obtained through personal contacts in the industry who, for commercial reasons, which to remain anonymous. The data is commercially sensitive and has been provided on the understanding that the results do not identify individual property-specific information that could be used for competitive intelligence purposes.

3.2 *Data Set One*

3.2.1 Data Collection Method

The properties used to form the sample will be derived from the data set used in the Stimson (2002) research. The data was collected using two

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[4] Data sourced from a professional valuation firm

cross-sectional surveys sent to 208 Australian retirement villages: the "Independent Residents Survey" and the "General Managers Survey." The villages were randomly selected from a list of members of the Retirement Villages Association in Australia. The first survey was specifically for the residents of the village, the second specifically for the manager.

The retirement villages were geographically spread among all Australian states and territories except the Northern Territory, in both metropolitan and non-metropolitan locations. There was a bias towards the south-eastern states of New South Wales, Victoria and South Australia (comprising 76.1% of the sample, versus the actual population proportion of 66.4%[5]) and towards metropolitan retirement villages (78.1% versus the actual percentage of Australians aged 65 years and over who live in metropolitan locations of 61.0%[6]). 111 villages participated in the study, of which 109 contained usable data, equating to a response rate of 53.3%. The survey data does not disclose the specific identity of the retirement village from which the data was sourced.

The managers of the retirement villages were sent two packages. The first contained the General Managers Survey. The second contained the

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[5] Australian Bureau of Statistics: 3239.0.55.001 – Population, Australian States and Territories – Electronic delivery, Sep 2002

[6] Australian Bureau of Statistics: 4102.0 – Australian Social Trends 2002

Independent Residents Surveys in sealed envelopes with a separate document containing strict instructions on how to sample the residents, with every seventh unit owner given a survey to complete. In total, 109 managers and 985 owners completed the survey. Drs. Stimson and Earl, the researchers who collected the data, bear no responsibility for the further analysis this study proposes to explore.

3.2.2 Research Instrument

The surveys contained a broad range of questions. A copy of the complete research instruments is contained in Appendix One (Independent Residents Survey) and Appendix Two (General Managers Survey). The Independent Residents Survey asked questions related not only to the attributes and services of their current residence, but also questions relating to the residents' previous residence including the type and location of the property and the reasons for moving. The residents were asked when they purchased the unit and how much they paid.

The General Managers Survey asked questions about the history, ownership and physical characteristics of the retirement village, as well as the services and facilities offered to residents. The General Managers Survey also asked for location-based information describing the village's proximity to certain location-based attributes (such as how far to the nearest hospital) and the current prices of the different units contained within the village.

The data required for this study was spread between the two research instruments. This posed a challenge, as each resident's response was required to be matched with the response from the manager of that particular retirement village. Fortunately, the data files from both surveys contained proximity data on eleven location-based housing attributes. By summing the distances (in metres) of all eleven attributes a relatively unique number was achieved, allowing resident responses to be matched with responses from managers.

Through the matching process, results from four retirement villages were excluded because they each had exactly the same matching number, making the resident responses unable to be assigned to a single retirement village. Other data points were excluded due to missing data.

3.3 *Data Set Two*

3.3.1 Data Collection Method

The sources of data for study two are twofold. First, transactional data including date, sales price, and unit number for twelve different over-50s lifestyle villages were obtained from a professional valuation in the south-east corner of the Australian state of Queensland. Gratitude is shown to a particular developer of these villages for providing the introduction to the valuer and being very supportive of the research. Second, observable data was collected from a range of different sources.

Site visits and collection of advertising material allowed property-specific variables such as unit size, number of units in the village, numbers of bedrooms and bathrooms, schedules of fees, and other property-specific information to be ascertained. Searches of records at the Titles Office enabled information such as lot size and age of development to be collected. Google Maps was used to accurately locate relevant sources of neighbourhood amenity and calculate distances between the units and the amenities. The www.myschool.edu.au website, a government run and funded rating tool for primary and secondary school in Australia, was used to calculate school quality ratings for particular areas. The ratings for grade 3, 5 and 7 tests of the two closest schools to each location were averaged and compared against the national average to give a percentage score. Crime statistics were sourced from the Queensland Police Service and are recorded as the number of incidents per 100,000 people living in the locality.

The 2011 Census published by the Australian Bureau of Statistics was used to identify other census tract information such as income levels, unemployment rates, indigenous population statistics and home ownership rates. The commercial company RPData was used to obtain median house prices for the different locations. RPData sources its data directly from the

Queensland Office of State Revenue and the Queensland Department of Environment and Resource Management.

All of this information was collated into a master database to be used for this study. Each property transaction was given a unique code and then the identifying information was removed and stored for future reference. The main database therefore contains all the pertinent information but maintains the confidentiality of the data.

3.4 *Variables*

As real estate is such a heterogeneous good, often dependent upon its geographic location, the potential list of variables is vast.

Table 2 in the previous chapter highlights the most commonly used characteristics in residential real estate hedonic modelling. Stephen Malpezzi (2003) adapted this list to a subset of characteristics he considers a suitable base for new research, including the following:

- Rooms, in the aggregate, and by type (bedrooms, bathrooms, etc.)
- Floor area of the unit
- Structural type (single family, attached or detached, if multifamily the number of units in the structure, number of floors)
- Type of heating and cooling systems
- Age of the unit

- Other structural features, such as presence of basements, fireplaces, garages, etc.
- Major categories of structural materials, and quality of finish
- Neighbourhood variables, perhaps an overall neighbourhood rating, quality of schools, socioeconomic characteristics of the neighbourhood
- Distance to the central business district, and perhaps to sub-centres of employment; access to shopping, schools and other important amenities
- Date of data collection (especially if the data are collected over a period of months or years)

(Malpezzi, 2003, p. 19)

Malpezzi’s advice can be taken as a starting point, with the target real estate providing direction as to the final choice of independent

3.4.1 Study One Variables

3.4.1.1 Study One Dependent Variables

Residents of a retirement village typically contract to three financial obligations when entering a retirement village. The first is the "entry contribution", or purchase price of the unit, which is paid upon entering the village. The second is an ongoing service fee, typically paid on a two-weekly cycle and closely linked to the operational expenses of the village such as gardening and maintenance. The third is a "deferred management fee," calculated as a percentage of the entry contribution, and is paid when selling the unit and vacating the village.

The entry contribution can be seen as the price of the unit, however it will be affected by the magnitude of the deferred management fee. The deferred management fee is recorded in the data and will be included as a contractual control variable. A retirement village unit purchaser will typically receive either a freehold, leasehold or license-based interest in the property and this is noted in the data.

To elicit the entry contribution, residents were asked the following question:

"What was the approximate entry contribution (the lump sum amount) you paid to enter this village？ (please circle one response)

(a) I paid no entry contribution – I am renting my unit

(b) Between $1 and $49,999 (go to question 36)

(c) Between $50,000 and $74,999 (go to question 36)

(d) Between $75,000 and $99,999 (go to question 36)

(e) Between $100,000 and $124,999 (go to question 36)

(f) Between $125,000 and $149,999 (go to question 36)

(g) Between $150,000 and $174,999 (go to question 36)

(h) Between $175,000 and $199,999 (go to question 36)

(i) Between $200,000 and $249,999 (go to question 36)

(j) Between $250,000 and $299,999 (go to question 36)

(k) Between $300,000 and $399,999 (go to question 36)

(l) Over $400,000 (go to question 36)

(m) Don’t know / can’t recall (go to question 36)

The responses to this question provide categorical data with categories of differing intervals. This will inhibit the interpretation of any independent variable coefficients, giving an indication of a general positive or negative effect on price only rather than a specific effect. Data including a response of either (a) or (m) to this question were excluded. The method of data collection also brings into question the reliability of the data. The accuracy of measurement of the variable is dependent upon the resident’s ability to recall how much they paid for the property when they entered the village, sometimes up to 20 years prior to completion of the survey.

The General Managers Survey contains questions that elicit discrete quantitative data about the prices of units in the retirement village (measured in dollars). The manager was asked the lowest, highest and average current price for each type of unit in the village (type was defined by the number of bedrooms). The manager was asked to differentiate between resales and new units, if the village was constructing new facilities at the time of the survey. To account for differences in attributes among units with the same number of bedrooms within a particular retirement village, the average current price will be used. It is important to note that this measure of price also has the potential to effect the reliability of the data as it is dependent upon the village manager to be accurate in the reporting of the current sales prices.

Given the discrete nature of the data, inferences can be drawn about the implicit prices of particular attributes. The sample size will be reduced for the model using the current average prices, as only one of each type of unit from each retirement village will be able to be included in the analysis.

We therefore have two measures of the price of a unit: the historical entry price measured categorically, and the average current price measured in dollars. Three models will be estimated: Model One using Price as the dependent variable, Model Two using the natural log of Price as the dependent variable, and Model Three using Entry Price as the dependent variable. The results from Model Three will be used to support the interpretation of the results from Model One and Model Two.

After allowing for excluded data, the sample sizes for Model One and Model Two were 236 while there were 241 data points available from the Independent Residents Survey for Model Three.

3.4.1.2 Study One Independent Variables

Consistent with the literature, a range of structural, neighbourhood, location, contract and temporal variables were collected from the survey results. Table 7 below highlights the variables used in Model One and Model Two, while Table 8 shows the variables used in Model Three.

Structural Variables

The structural attributes controlled for in the study include items both general to the retirement village and specific to the individual unit. The overall quality of the retirement village unit is measured via two proxy variables. The presence of a pool in the retirement village is considered an indication of a higher quality retirement village in general than a village without a pool, and the data is additionally controlled for whether the village is run as a for-profit business venture or as a not-for-profit organisation. The age of the unit and its number of bedrooms are additionally controlled. The spaciousness of the village is controlled by a measure of the lot size in square metres per unit (Tang & Yiu, 2010).

Neighbourhood Variables

The data set contains limited information about the neighbourhood characteristics of each unit. Significantly, given slight differences in the legislative impact on retirement villages among different Australian states and territories, the data includes a state variable. Victoria is used as the base state, with dummy variables indicating a location in other states. Model Three contains no data from the state of Queensland and so there is no Queensland state dummy variable. Further differentiating the neighbourhood amenity is a variable identifying whether the unit is in a metropolitan location, based on the presumption that the range and number of neighbourhood amenities in a metropolitan location will be greater than that in a non-metropolitan location. The proportions of properties in each category are shown in Tables Table 5 and Table 6.

Table 5: Distribution by State – Model One and Model Two

Australian Capital Territory	3.4%
New South Wales	24.5%
Queensland	5.5%
South Australia	15.6%
Tasmania	1.7%
Victoria	38.3%
Western Australia	11.0%
Metropolitan	84.4%
Non-Metropolitan	15.6%

Table 6: Distribution by State – Model Three

Australian Capital Territory	4.6%
New South Wales	15.4%
South Australia	7.5%
Tasmania	3.3%
Victoria	54.8%
Western Australia	14.5%
Metropolitan	80.9%
Non-Metropolitan	19.1%

Location Variables

The location attributes are the variables of interest in this study. Medical amenity is measured in metres to the nearest general practitioner (doctor), medical centre and hospital. A general practitioner is typically the first port of call for a patient suffering from an illness of a minor nature. Medical centres typically accommodate a range of allied health professionals, including pathologists, psychologists and radiographers to which patients are referred, in addition to general practitioners. Hospitals typically provide medical services of a more significant nature. The separation of medical amenity into three separate sources is consistent with Kiel and Zabel's (2008) advice on location-based amenity being divided into effects from different distances.

Contract and Temporal Variables

To account for differences in contractual arrangements, each unit contains a reference to its ten year deferred management fee and whether or not the purchase conveys title of the unit to the owner, as conveyance of title is consistently connected with a positive effect on price (Mendez, 2006). Temporal differences are controlled for the Entry Price dependent variable by a time variable representing the number of years since the purchase occurred. The current average price dependent variable is cross-sectional, negating the need for temporal control.

Table 7: Variables in Model One and Model Two for Study One

Code	Variable	Min	Max	Mean	Std. Dev	Exp Sign
Dependent variables						
PRICE	Current average price ($)	62,000	690,000	182,926	100,812	
LN_PRICE	Log of the current average price	11.035	13.444	11.995	0.478	
Independent variables						
Structural						
AGE	Age of the unit (years)	0	54	11.215	6.519	-
BRDMS	Number of bedrooms	1	4	1.932	0.750	+
POOL	Pool in the village? (1=Yes)	0	1	0.561	0.497	+
PROFIT	Is the village run as a for profit business venture? (1=Yes)	0	1	0.697	0.461	+
SQMTRS	Village lot area per unit (metres^2)	99.5	77,700	1,540.827	7,113.618	+
Neighbourhood						
ACT	Is the village in the Australian Capital Territory (1=Yes)	0	1	0.034	0.181	?
NSW	Is the village in New South Wales (1=Yes)	0	1	0.245	0.431	?
QLD	Is the village in Queensland ((1=Yes)	0	1	0.055	0.228	?
SA	Is the village in South Australia (1=Yes)	0	1	0.156	0.364	?
TAS	Is the village in Tasmania (1=Yes)	0	1	0.017	0.129	?
WA	Is the village in Western Australia (1=Yes)	0	1	0.110	0.313	?
METRO	Is the village in a metropolitan location? (1=Yes)	0	1	0.844	0.364	+
Location						
GENPRAC	How many metres to the nearest General Practitioner (doctor)?	20	8,000	1,085.489	1,445.769	?
HOSP	How many metres to the nearest hospital?	50	25,000	6,072.707	4,366.576	?
MEDCTR	How many metres to the nearest medical centre?	20	10,000	1,312.194	1,790.933	?
Contract						
DMF	What is the 10 year deferred management fee (%)?	0	75	23.175	12.804	-
TITLE	Does the purchaser gain title to the property? (1=Yes)	0	1	0.359	0.481	+

Table 8: Variables in Model Three for Study One

Code	Variable	Min	Max	Mean	Std. Dev	Exp Sign
Dependent variables						
ENTRY	Entry Price	2	9	5.095	1.878	
Independent variables						
Structural						
AGE	Age of the unit (years)	0	24	7.602	7.350	-
BRDMS	Number of bedrooms	1	3	1.983	0.456	+
POOL	Pool in the village? (1=Yes)	0	1	0.257	0.438	+
PROFIT	Is the village run as a for profit business venture? (1=Yes)	0	1	0.270	0.445	+
SQMTRS	Village lot area per unit (metres^2)	130.72	2941.18	764.71	809.11	+
Neighbourhood						
ACT	Is the village in the Australian Capital Territory (1=Yes)	0	1	0.046	0.209	?
NSW	Is the village in New South Wales (1=Yes)	0	1	0.154	0.361	?
SA	Is the village in South Australia (1=Yes)	0	1	0.075	0.263	?
TAS	Is the village in Tasmania (1=Yes)	0	1	0.033	0.180	?
WA	Is the village in Western Australia (1=Yes)	0	1	0.145	0.353	?
METRO	Is the village in a metropolitan location? (1=Yes)	0	1	0.809	0.394	+
Location						
GENPRAC	How many metres to the nearest General Practitioner (doctor)?	0	6000	788.403	1,110.958	?
HOSP	How many metres to the nearest hospital?	200	25000	5,801.452	4,451.061	?
MEDCTR	How many metres to the nearest medical centre?	0	6000	1,046.286	1,296.568	?
Contract						
DMF	What is the 10 year deferred management fee (%)?	0	6	1.718	1.030	-
Temporal						
TENURE	How many years since the resident purchased the unit?	0	6	3.942	1.425	-

3.4.2 Study Two Variables

Study two benefits from the accuracy of recorded transactional data as reported to, and verified by, a professional property valuation firm. This measurement procedure will help to overcome some of the reliability concerns evident in Study One. The dependent variable in Study Two will be the price paid for the over-50s lifestyle village unit. The price paid and date sold of 300 individual units contained in 12 different over-50s lifestyle villages were provided by the professional valuation firm. The price can be represented in normal or logarithmic form, depending on the functional form desired in the analysis.

Complementing the price paid for each unit is the weekly fee paid by residents of the over-50s lifestyle villages. A resident purchases and owns the building but does not own the land on which the building sits. For the right to occupy the site the resident pays a weekly rental fee. This figure is included in the database and is included as contractual independent variable.

3.4.2.1 Study Two Independent Variables

Structural Variables

Using information gleaned from site visits and marketing material a range of structural variables were collected from the twelve over-50s lifestyle villages. The variables include the number of bedrooms and bathrooms for each unit, the floor size, single or double car garage, the lot size of the village per unit, and whether the unit was attached or a stand-alone building.

Location Variables

A range of distances to different sources of locational amenity were calculated for each of the twelve villages. In addition to the distance to the nearest medical centre and hospital,[7] these included the distance to the nearest Central Business District, train station, local retail store, neighbourhood retail store, regional retail store, golf course, and gambling facility.

Neighbourhood Variables

To account for neighbourhood heterogeneity a range of neighbourhood-specific census tract variables were collected. These include median total family income per week, the unemployment rate, the percentage of the population that is indigenous, the crime rate, the home ownership rate, a

[7] The distance to the nearest General Practitioner is not included in this study as in all twelve cases the nearest General Practitioner was located in a medical centre with other allied health professionals. This reflects a trend in the way family medical services are delivered towards the centre-based delivery, with large syndicates such as Healthscope consolidating traditional family practices.

rating for local school quality, the population growth rate, and the median house price.

Contract and Temporal Variables

The weekly fees payable in each over-50s lifestyle village are included, as is a series of dummy variables indicating the quarter in which the sale took place. The transactional data ranges from 1 July 2010 to 30 November 2012 and so there are eight time dummies, allowing quarter 3 2010 to be the base time reference point.

Special Note on Locational and Neighbourhood Variables

Study two employs data from a proprietary database of a unique category of housing. One unique feature of this category of residential housing is that it is clustered: many units occupy essentially the same location. To illustrate this point, 39 of the 300 data points in study come from one particular village with another 37 coming from another individual village. With numerous data points essentially containing the exact same information, significant multicollinearity issues are imposed on the model.

Multicollinearity does not reduce the reliability or predictive capability of a model, however it does potentially invalidate the reliability of an individual independent variable. A model employing several independent variables suffering from multicollinearity can still show how well the collection of the variables together affects the dependent variable, but the independent coefficient estimators may not be valid. Another issue with multicollinearity is that it causes statistical packages, such as Eviews that is used in this research, to be incapable of computing the regression coefficients.

A potential solution to this problem would be to reduce the transactions from each location to one of each type of unit (different combinations of bedrooms and bathrooms, etc.). Applying this logic to the three hundred data points from the 12 different villages resulted in 31 distinct data points. Given the number of desired independent variables to be included in the analysis, there were not enough degree of freedom to obtain any meaningful results from this condensed sample.

For this reason, a single independent variable will be used to estimate the effects of neighbourhood and locational effects, allowing the distance to medical facilities estimators to be determined in isolation. Consistent with the advice of Cutter and DeWoody (2010), the median house price of the location will be used and this will allow all 300 transactions to be included in the analysis.

Table 9: Variables Collected for Study Two

Variable	Description	Mean	Median	Maximum	Minimum	Std. Dev.	Expected Sign
Dependent Variables							
PRICE	Price in Dollars	399,759.90	371,775.00	780,000.00	82,000.00	111,769.10	
LN_PRICE	Log of Price	12.86	12.83	13.57	11.31	0.27	
Independent Variables							
AGE	Age in years	1.18	0.00	24.00	0.00	4.56	-
ATTACHED	Is the property attached? (1=Yes)	0.98	1.00	1.00	0.00	0.15	-
DD_HOSPITAL	Driving Distance to the nearest hospital	12,027.08	12,717.00	15,971.00	2,203.42	2,458.91	-
DD_MEDICAL_CENTRE	Driving Distance to the nearest medical centre	1,580.77	1,628.50	6,061.33	73.00	941.39	-
ED_HOSPITAL	Euclidean Distance to the nearest hospital	7,797.41	7,073.50	12,071.00	1,003.42	1,838.46	-
ED_MEDICAL_CENTRE	Euclidean Distance to the nearest medical centre	1,298.40	1,571.50	4,561.33	73.00	732.46	-
FEES	Weekly fees in dollars	166.64	174.40	199.00	125.00	13.36	-
MEDIAN_HOUSE_PRICE	Median house price of the area	392,165.00	358,000.00	521,000.00	303,750.00	63,050.41	+
NEW	Is the property new? (1=Yes)	0.93	1.00	1.00	0.00	0.26	+
SIZE	Size of the property in square meters	166.83	163.25	247.00	105.00	26.50	+

3.5 *Functional Form*

There is no consistent view on which functional form is superior in hedonic model estimation. Many researchers estimate the model in several different forms, relying on adjusted R^2 figures to determine the most appropriate model subsequent to the analysis (Malpezzi, 2003).

Generally speaking, the equation can take one of two major forms: linear or non-linear. The linear model is as presented earlier, with the dependent variable value being a function of a collection of hedonic independent variables;

$$(5) \qquad V = \alpha + \beta_1 S + \beta_2 N + \beta_3 C + \beta_4 L + \beta_5 T + \varepsilon$$

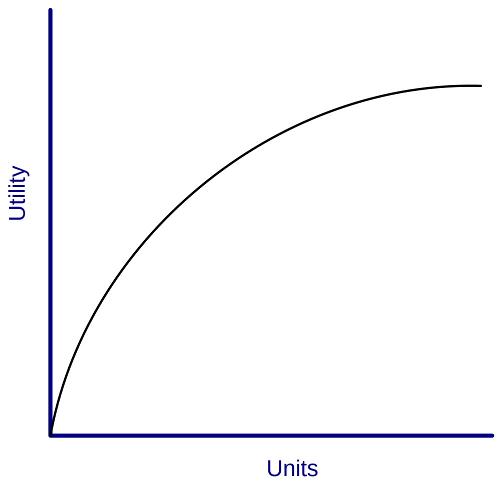
where V is the house value, S, N, C, L, and T are the structural, neighbourhood, contract, location, and time characteristics of the house, and βi and ε are the regression coefficients and error term.

That said, hedonic price models are inherently non-linear. The housing stock is heterogeneous, as are the consumers who may place a different valuation on a given bundle of characteristics to others. The functional form will only be linear if consumers can "repackage" (Malpezzi, 2003, p. 20). This clearly cannot happen, as consumers cannot choose individual characteristics of one particular house and combine them with characteristics of another

(Halvorsen & Pollakowski, 1981). It is fair to say a consumer only has this type of choice through initial construction. Even then, selection is subject to the physical restraints of the location, cost and availability, to name a few. In the face of this evidence, researchers continue to estimate linear models as a basis for their research. The output can add explanatory power to interpretation of the more complex non-linear models.

Further support for non-linear model specification is found in the application of Prospect Theory to house price estimation. Originated by Kahneman and Tversky, Prospect Theory grounds decision-making in terms of value and acknowledges that the translation of utility into value may not be linear (Australian Stock Exchange, 2009). Broadly speaking, this is known as diminishing marginal utility and is typically represented as shown in Figure 8.

Figure 8: Diminishing Marginal Utility



In terms of real estate, the price premium a consumer may allocate to a house with two bedrooms rather than one may not equal the premium they would pay for a house with five bedrooms rather than four: the *marginal implicit price* alters for different levels of the attribute. A simple linear model would state that the addition of one bedroom to a house would alter the price of the house by a fixed value, no matter if the house only had one bedroom or if it had four. By incorporating the log of variables, or variables in quadratic form, the model can account for non-linear relationships.

The semi-log model is a very common form that allows linear relationships to be expressed on a logarithmic basis for the dependent variable. It can be written as follows:

$$(6) \qquad \ln V_i = \beta_0 + S\beta_1 + N\beta_2 + L\beta_3 + C\beta_4 + T\beta_5 \ \ \varepsilon$$

where $\ln V_i$ is the natural log of the price of the i^{th} house, S, N, L, C, and T are the structural, neighbourhood, location, contract, and time characteristics of the house, and βi and ε are the regression coefficients and error term.

The advantages of a semi-log functional form over the linear form are as follows (Christensen et al., 1973):

1. The price of one characteristic depends in part on the other characteristics of the house. For example, a linear model assumes that the increase in value of the house is the same for the addition of one bathroom to a one bathroom house as it is for a house that already has five bathrooms, an unlikely situation. Value added under a semi-log model can "vary proportionally with the size and quality of the home" (Box & Cox, 1964).
2. The estimated regression coefficients can be easily interpreted as approximately the percentage change in house value given a unit movement in the independent variable. This interpretation can be improved by a simple process explained by Halvorsen and Pollakowski (1981): $e^b - 1$ will give a more accurate estimation of the coefficient, where b is the estimated coefficient.
3. Linear models suffer from heteroskedasticity (unequal variance in the regression errors) causing regression estimates to be inefficient and compromising tests of hypothesis on the estimated coefficients. The semi-log form overcomes this issue.
4. The semi-log form is easy to compute, adding to the simplicity of the research.
5. Dummy variables can be used as independent variables, creating significant flexibility to suit the particular research sample.

Other non-linear forms can extend the flexibility even further, including the log-log and translog forms (Sirmans et al., 2005). A further branch of research follows direction from Box and Cox (1978) and claims even further flexibility under highly specified conditions.

Doubt has been cast on the ability of the Box-Cox method to efficiently estimate marginal implicit prices (Cassel & Mendelsohn, 1985). Cropper, Deck and McConnell (1988) conducted a comparison of six different functional forms (linear, semi-log, log-log, Box-Cox linear, quadratic, Box-Cox quadratic) on house price data from Baltimore Maryland to determine the most appropriate form under different circumstances. They determined:

"when certain variables are not observed, or when a variable is replaced by a proxy, a simple linear hedonic price function consistently outperforms the quadratic Box-Cox function, which provides badly biased estimates of "hard to measure" attributes" (Cropper, et al., 1988 , p. 668)

The full range of attributes deriving utility for consumers of residential real estate is not known. Additionally, the drivers of utility may not be identifiable as distinct attributes. The number of bedrooms is easily observed, however an assessment of the overall "quality" of a piece of real estate is not easily observed. A consumer may make a determination regarding the overall quality of a house and utilise this in their pricing decision, but that determination may incorporate the summation of quite a number of attributes, some of which even the consumer may not be cognisant. A researcher is left to identify appropriate proxies for such attributes and incorporate those proxies into the hedonic model.

3.5.1 Models for Study One

3.5.1.1 Model One

Simple linear hedonic price function:

(6) $PRICE = \beta_0 + \beta_1*DMF + \beta_2*TITLE + \beta_3*AGE + \beta_4*BEDROOMS + \beta_5*POOL + \beta_6*PROFIT + \beta_7*SQMETRES + \beta_8*METRO + \beta_9*ACT + \beta_{10}*NSW + \beta_{11}*QLD + \beta_{12}*SA + \beta_{13}*TAS + \beta_{14}*WA + \beta_{15}*GENPRAC + \beta_{16}*HOSPITAL + \beta_{17}*MEDCENTRE + \varepsilon$

3.5.1.2 Model Two

Semi-log hedonic price function:

(7) $LNPRICE = \beta_0 + \beta_1*DMF + \beta_2*TITLE + \beta_3*AGE + \beta_4*BEDROOMS + \beta_5*POOL + \beta_6*PROFIT + \beta_7*SQMETRES + \beta_8*METRO + \beta_9*ACT + \beta_{10}*NSW + \beta_{11}*QLD + \beta_{12}*SA + \beta_{13}*TAS + \beta_{14}*WA + \beta_{15}*GENPRAC + \beta_{16}*HOSPITAL + \beta_{17}*MEDCENTRE + \varepsilon$

3.5.1.3 Model Three

Simple linear hedonic price function:

(8) $ENTRYPRICE = \beta_0 + \beta_1*DMF + \beta_2*AGE + \beta_3*BEDROOMS + \beta_4*POOL + \beta_5*PROFIT + \beta_6*SQMETRES + \beta_7*METRO + \beta_8*ACT + \beta_9*NSW + \beta_{10}*SA + \beta_{11}*TAS + \beta_{12}*WA + \beta_{13}*GENPRAC + \beta_{14}*HOSPITAL + \beta_{15}*MEDCENTRE + \varepsilon$

3.5.2 Models for Study Two

All models will use Price as the dependent variable, either in normal or logarithmic form, with two measurement of distance for medical proximity: Euclidean Distance (ED) and Driving Distance (DD). There are consequently four different specifications.

3.5.2.1 Model Four

(9) $PRICE = \beta_0 + \beta_1*AGE + \beta_2*SIZE + \beta_3*ATTACHED + \beta_4*NEW + \beta_5*AREA\_PER\_UNIT + \beta_6*FEES + \beta_7*Q42010 + \beta_8*Q1\_2011 + \beta_9*Q2\_2011 + \beta_{10}*Q3\_2011 + \beta_{11}*Q4\_2011 + \beta_{12}*Q1\_2012 + \beta_{13}*Q2\_2012 + \beta_{14}*Q3\_2012 + \beta_{15}*MEDIAN\_HOUSE\_PRICE + \beta_{16}*ED\_MEDCENTRE + \beta_{17}*ED\_HOSPITAL + \varepsilon$

3.5.2.2 Model Five

(10) $LN\_PRICE = \beta_0 + \beta_1*AGE + \beta_2*SIZE + \beta_3*ATTACHED + \beta_4*NEW + \beta_5*AREA\_PER\_UNIT + \beta_6*FEES + \beta_7*Q42010 + \beta_8*Q1\_2011 + \beta_9*Q2\_2011 + \beta_{10}*Q3\_2011 + \beta_{11}*Q4\_2011 + \beta_{12}*Q1\_2012 + \beta_{13}*Q2\_2012 + \beta_{14}*Q3\_2012 + \beta_{15}*MEDIAN\_HOUSE\_PRICE + \beta_{16}*ED\_MEDCENTRE + \beta_{17}*ED\_HOSPITAL + \varepsilon$

3.5.2.3 Model Six

(11) $PRICE = \beta_0 + \beta_1*AGE + \beta_2*SIZE + \beta_3*ATTACHED + \beta_4*NEW + \beta_5*AREA\_PER\_UNIT + \beta_6*FEES + \beta_7*Q42010 + \beta_8*Q1\_2011 + \beta_9*Q2\_2011 + \beta_{10}*Q3\_2011 + \beta_{11}*Q4\_2011 + \beta_{12}*Q1\_2012 + \beta_{13}*Q2\_2012 + \beta_{14}*Q3\_2012 + \beta_{15}*MEDIAN\_HOUSE\_PRICE + \beta_{16}*DD\_MEDCENTRE + \beta_{17}*DD\_HOSPITAL + \varepsilon$

3.5.2.4 Model Seven

(12) $LN\_PRICE = \beta_0 + \beta_1*AGE + \beta_2*SIZE + \beta_3*ATTACHED + \beta_4*NEW + \beta_5*AREA\_PER\_UNIT + \beta_6*FEES + \beta_7*Q42010 + \beta_8*Q1\_2011 + \beta_9*Q2\_2011 + \beta_{10}*Q3\_2011 + \beta_{11}*Q4\_2011 + \beta_{12}*Q1\_2012 + \beta_{13}*Q2\_2012 + \beta_{14}*Q3\_2012 + \beta_{15}*MEDIAN\_HOUSE\_PRICE + \beta_{16}*DD\_MEDCENTRE + \beta_{17}*DD\_HOSPITAL + \varepsilon$

3.6 *Market Definition*

Palm (2003) suggests the analysis of residential house prices should be segmented into submarkets, so long as the submarkets are stringently defined and likely to exhibit significant differences in attribute price structures. This approach allows the utility-deriving characteristics of the sample data to be relatively consistent among data points, eliminating inherent specification issues.

Sirmans, Macpherson and Zietz (2005) found that results of HPM research are *"location-specific and* (are) *difficult to generalize across different geographic locations,"* (p.4) suggesting that while independent variable coefficient estimates may be robust in a geographically defined area, they may change among different submarkets. This view is tempered in more recent work, with a recent meta regression analysis of hedonic pricing models for single family homes showing some *"hedonic estimates do experience some significant variation but perhaps not as much as traditionally believed"* (Sirmans et al., 2006, p. 232)

Study One broadly takes data from all regions of Australia except the Northern Territory. The inclusion of data from such a large market will assist generalisability, while at the same time perhaps limiting the explanatory power on individual housing attributes. While limited by the data available, attempts are made at segmenting into submarkets through the identification of the State and whether it is a metropolitan or rural location.

Study Two effectively controls for submarket differences by including the control variable of the local area’s median house price to account for neighbourhood heteroskedasticity.

3.7 *Conclusion*

The two studies will apply hedonic pricing theory to two distinct samples of Australian retirement housing units to determine the effect of location-based amenity on the price of retirement-specific housing. The data for study one is collected from two surveys sampling 985 owners and 109 managers in 109 retirement villages in seven of Australia’s eight states and territories. The data for study two is collected from a proprietary database of transactional data of the sales of over-50s lifestyle villages in the south east corner of the Australian state of Queensland and supplemented with observable data from multiple different sources. The results are presented in Chapter 4.

4 Chapter Four: Results

The previous three chapters have identified a research question of importance supported by a theoretical framework informed by a review of the extent literature across several disciplines. Chapter Four presents the results of the hedonic regression models used to estimate the hypothesised relationships. First, the assumptions underlying the statistical technique are examined to ensure the validity of the statistical analysis. Second, the results of the hedonic regressions are presented and explained. Finally, testing of the three research hypotheses is conducted and presented.

4.1 *Regression Assumption Testing*

Violations of Ordinary Least Squares (OLS) assumptions can result in biased or inefficient parameter estimates and/or standard errors. Before presenting the results of models one to three, the regression assumptions should be tested to provide a level of validity to the estimated parameters. Biased standard errors can cause errors in hypothesis testing, leading to incorrect conclusions regarding the effect of the affected independent variables on the dependent variable. The efficient parameter estimate is the one with the minimum of variance and is statistically more likely to accurately represent the relationship.

There are seven assumptions that underpin the efficacy of OLS regression: a linear relationship exists between the dependent variable and the independent variables, the errors are statistically independent from one another, the expected value of the errors is zero, the independent variables are not statistically collinear, the independent variables contain no measurement error, the residuals have constant variance, and the errors are normally distributed. If the first five assumptions are satisfied, the parameter estimates of the OLS regression will be unbiased and therefore representative of the population. If assumption six is satisfied, the parameter estimates will be efficient (that is, have minimum variance and therefore be the statistically best estimates), and if assumption seven is satisfied then hypothesis testing can be conducted using *t* and *F* tests.

All seven models suffered from heteroskedasticity, as evidenced by running White's Heteroskedasticity Test. This means the variance of the errors is not constant and violates the assumption of homoskedasticity. The tests are presented in Appendix Four on page 227 and the results are shown in Table 10.

In all seven cases we can reject the null hypothesis of no heteroskedasticity at the 5% level of significance, stating heteroskedasticity is present. This can be controlled by using a weighted least squares technique, specifically White's Heteroskedasticity Consistent Covariance process (White, 1980). The results as presented are from regressions employing White's process.

Table 10: Results of White's Heteroskedasticity tests

	F-statistic	p-value
Study One		
Model One	4.5335	0.0000
Model Two	1.6256	0.0394
Model Three	3.1579	0.0000
Study Two		
Model Four	2.0865	0.0000
Model Five	1.9369	0.0001
Model Six	1.9516	0.0001
Model Seven	1.9573	0.0001

The Jarque-Bera statistic can be used to test if the errors are normally distributed and have a mean of zero. All three models satisfy these assumptions, as evidenced by the following table. Further details on the Jarque-Bera tests can be found in Appendix Five on page 231.

Table 11: Jarque-Bera Statistics

	Jarque-Bera Statistic	p-value
Study One		
Model One	5.1389	0.0766
Model Two	0.7000	0.7047
Model Three	2.3102	0.3150
Study Two		
Model Four	2.6601	0.2645
Model Five	3.5408	0.1703
Model Six	2.0989	0.3501
Model Seven	3.1041	0.2118

A common method to detect the presence of multicollinearity among the independent variables is through the use of variance inflation factors (VIFs). The VIF identifies the extent to which an independent variable can be explained by the other independent variables in the equation. To obtain a particular variable's VIF, it is regressed against all other independent variables in the model. The resultant R^2 is then input into the following equation to arrive at the factor.

(9)

$$VIF(\hat{\beta}_j) = \frac{1}{1 - R^2_j}$$

As a general rule of thumb a VIF of greater than 10 is considered evidence of the presence of multicollinearity (Hair et al., 1998; Ryan, 1997). The VIFs for all seven models are shown in the tables below and the individual regressions and calculations can be found in Appendix Six starting on page 235. The VIFs for models one and two are the same, as they use the same set of data with merely the dependent variable altered.

Table 12: Variance Inflation Factors for Models One and Two

Independent Variable	Variance Inflation Factor
DMF	1.48
TITLE	1.54
AGE	1.14
BEDROOMS	1.07
SQMETRES	1.13
POOL	1.82
PROFIT	1.25
METRO	1.45
ACT	1.48
NSW	1.83
QLD	1.28
SA	1.79
TAS	1.23
WA	1.39
GENPRAC	3.78
HOSPITAL	1.20
MEDCENTRE	3.52

Table 13: Variance Inflation Factors for Model Three

Independent Variable	Variance Inflation Factor
DMF	1.50
AGE	1.77
BEDROOMS	1.21
SQMETRES	1.56
POOL	1.59
PROFIT	2.40
TENURE	1.06
METRO	1.98
ACT	3.21
NSW	1.69
SA	1.18
TAS	1.35
WA	2.12
GENPRAC	3.95
HOSPITAL	1.64
MEDCENTRE	5.35

The VIF analysis indicates a lack of multicollinearity in all three models using data from study one. Further evidence of the lack of multicollinearity is the fact that the high R^2 figures for the seven models are accompanied by a number of significant explanatory variables: if multicollinearity were present we would expect to see relatively few significant explanatory variables.

The variance inflation factors for the variables of interest in models four through seven, using data from study two, show a lack of muilticollinearity indicating we can be confident the coefficient estimates are valid. It should be noted that the VIFs for the Euclidean distance to the nearest medical centre are close to the suggested maximum of ten. These figures reduce when measuring proximity by driving distance.

Given the clustered nature of the data used in study two, it is not surprising to see multicollinearity in some of the control variables. The median house price variable shows evidence of multicollinearity in models four and five which is to be expected and consequently the results should be viewed with an understanding that the effect is not biased or inefficient but that the effect may be spread amongst a range of the other high-VIF factors. In the case of models four and five these are the time dummies and the site area per home.

The Durbin-Watson statistic is used to detect the presence of autocorrelation in the residuals of the regression models. A Durbin-Watson statistic within the range of 1.50-2.50 is considered acceptable and indicative of no autocorrelation in the residuals, meaning the errors are statistically independent of one another. All seven models satisfy this test, as evidenced by Table 14 below.

Table 14: Test for Independence of the Errors

	Durbin-Watson Statistic
Study One	
Model One	1.9238
Model Two	1.7215
Model Three	2.1254
Study Two	
Model Four	2.2902
Model Five	2.4357
Model Six	2.3204
Model Seven	2.4609

4.1.1 Summary

The raw regression results for the three models in Study One and the four models in Study Two satisfied all OLS assumptions excepting that of homoskedasticity (a constant variance of the error terms) and some isolated multicollinearity in models four and five. The models were run again using White's Heteroskedasticity Consistent Covariance remedy to overcome the heteroskedasticity. The results as presented in section 4.2 can therefore be considered to be the best linear unbiased estimates of the relationships modelled by the regressions.

4.2 *Results*

The results from the two studies provide some interesting insights into the pricing of retirement specific housing and are presented in the tables below. The full estimation equations can be seen in Appendix Seven on page 273.

4.2.1 Study One

All significant control variables are of a sign consistent with expectations and the three models identify proximity to a hospital as a significantly positive effect on price. Models One and Two allow us to infer the *dollar* effect of individual attributes on price, whereas the categorical nature of the price data in model three only allows for inferences about the *direction* of the effect, either positive or negative.

4.2.1.1 Model One

The model exhibits strong explanatory power, with 72.1% of the variance in price explained by variance in the explanatory variables. The model suggests gaining legal title to the property, its age, the number of bedrooms, whether the complex has a swimming pool, a metropolitan location, being in the states of New South Wales or Tasmania, and proximity to a hospital are all significant drivers of the price of a retirement village unit.

Table 15: Results of Model One

Dependent Variable: PRICE

Variable	Coefficient	Std. Error	t-Statistic		Prob.
C	-31000.53	22216.67	-1.395372		0.1645
DMF	-186.4989	391.9605	-0.475810		0.6347
TITLE	22455.36	10788.20	2.081475	*	0.0387
AGE	-1076.981	487.3900	-2.209690	*	0.0283
BEDROOMS	55304.03	5813.264	9.513421	***	0.0000
SQMETRES	-0.298577	0.252955	-1.180359		0.2393
POOL	27162.01	9067.319	2.995595	***	0.0031
PROFIT	29861.48	7733.095	3.861517	***	0.0002
METRO	72060.42	11835.40	6.088552	***	0.0000
ACT	860.4735	31374.68	0.027426		0.9781
NSW	121786.3	13431.68	9.067093	***	0.0000
QLD	9601.579	11526.62	0.832992		0.4059
SA	-2505.683	11255.36	-0.222621		0.8241
TAS	-75572.97	23802.34	-3.175023	***	0.0017
WA	-7552.582	12272.15	-0.615425		0.5390
GENPRAC	-2.453277	4.800617	-0.511034		0.6099
HOSPITAL	-1.824804	0.770309	-2.368924	*	0.0188
MEDCENTRE	2.847511	3.796711	0.749994		0.4542

R-squared	0.721559	Mean dependent var	183115.6
Adjusted R-squared	0.697033	S.D. dependent var	97257.06
S.E. of regression	53532.67	Akaike info criterion	24.69542
Sum squared resid	5.53E+11	Schwarz criterion	24.98136
Log likelihood	-2587.367	F-statistic	29.42026
Durbin-Watson stat	1.923793	Prob(F-statistic)	0.000000

***Significant at α=.001 **Significant at α=.01 *Significant at α=.05

Structural Variables

Consistent with the majority of previous studies, the increased age of a property decreases its price, in this case by $1,076.98 per year. There is very strong support for a purchaser paying more for a unit with more bedrooms, with the data suggesting each additional bedroom to add $55,304.03 to the price of a unit. A swimming pool in the complex will increase the price of a unit by $27,162.01 while a unit in a retirement village run on a for-profit basis will command a $29,861.48 premium over its not-for-profit counterpart.

Neighbourhood Variables

A retirement village unit in a metropolitan location will sell, on average, for $72,060.42 more than an otherwise identical unit in a non-metropolitan location. Relative to the state of Victoria, retirement village units in New South Wales will sell at a premium of $121,786.30 while those in Tasmania sell at a discount of $75,572.97.

Contract and Temporal Variables

The model suggests that gaining legal title to the property is valued by purchasers, with such properties exhibiting an increased price of $22,455.36.

Location Variables

Of the medical facility amenities studied, only proximity to the highest order service of the hospital exhibits a significant influence on price. For every kilometre a retirement village unit is closer to a hospital, its price rises by $1,824.80.

4.2.1.2 Model Two

Consistent with the results found with Model One, Model Two exhibits strong explanatory power, with 76.6% of the variance in the natural log of price explained by variance in the explanatory variables. All significant independent variables identified in Model One are confirmed with the exception of Title which, even though it is in the same direction, becomes insignificant.

Structural Variables

A ten year increase in age of a unit decreases its price by 5.17%, while an additional bedroom adds a premium of 27.5%. The indicators of the general quality of the property, the existence of a pool and whether the village is run on a for-profit basis, also have a positive effect on price (18.9% and 17.1% respectively).

Table 16: Results of Model Two

Dependent Variable: LNPRICE

Variable	Coefficient	Std. Error	t-Statistic		Prob.
C	10.84192	0.100153	108.2539	***	0.0000
DMF	0.002345	0.001597	1.468262		0.1437
TITLE	0.048562	0.042799	1.134647		0.2579
AGE	-0.005170	0.002434	-2.124135	*	0.0349
BEDROOMS	0.275172	0.021586	12.74785	***	0.0000
SQMETRES	3.38E-07	1.05E-06	0.320552		0.7489
POOL	0.188845	0.043729	4.318550	***	0.0000
PROFIT	0.171134	0.040849	4.189455	***	0.0000
METRO	0.385002	0.053194	7.237770	***	0.0000
ACT	0.070987	0.109286	0.649547		0.5168
NSW	0.544484	0.053947	10.09300	***	0.0000
QLD	0.061135	0.050994	1.198867		0.2320
SA	-0.021064	0.069140	-0.304649		0.7610
TAS	-0.401723	0.119324	-3.366660	***	0.0009
WA	-0.084173	0.060355	-1.394627		0.1647
GENPRAC	-2.31E-06	2.19E-05	-0.105231		0.9163
HOSPITAL	-1.15E-05	3.32E-06	-3.469405	***	0.0006
MEDCENTRE	4.75E-06	1.54E-05	0.307743		0.7586

R-squared	0.765525	Mean dependent var	12.00005
Adjusted R-squared	0.744871	S.D. dependent var	0.475085
S.E. of regression	0.239966	Akaike info criterion	0.064813
Sum squared resid	11.11370	Schwarz criterion	0.350754
Log likelihood	11.16220	F-statistic	37.06556
Durbin-Watson stat	1.721542	Prob(F-statistic)	0.000000

***Significant at α=.001 **Significant at α=.01 *Significant at α=.05

Neighbourhood Variables

A metropolitan location adds 38.5% to the price of a retirement village unit, while New South Wales prices are on average 54.4% higher than Victoria with Tasmanian units priced at a discount of 40.2%.

Contract and Temporal Variables

Neither the deferred management fee nor gaining title when purchasing the unit showed a significant effect on price in Model Two.

Location Variables

Distance to the nearest hospital once again showed a significant effect on price, with every kilometre of increased proximity increasing retirement village unit prices by 0.0115%. The variables measuring distance to a general practitioner or medical centre were not significant.

4.2.1.3 Model Three

Model Three shows good explanatory power with 40.2% of the variance in the Entry Price variable explained by variance in the independent variables. Fewer independent variables are significant, however those that are give further support to the evidence provided in the first two models. The Deferred

Management Fee and distance to the nearest General Practitioner join the list of previously significant variables, and the temporal control variable (Tenure: the number of years since the resident purchased the unit and therefore a dating of when the price was recorded) is statistically significant.

Table 17: Results of Model Three

Dependent Variable: ENTRYPRICE

Variable	Coefficient	Std. Error	t-Statistic		Prob.
C	6.726134	0.862296	7.800260	***	0.0000
DMF	-0.412796	0.140446	-2.939186	***	0.0037
AGE	-0.051676	0.017360	-2.976742	***	0.0033
BEDROOMS	0.471458	0.267958	1.759447		0.0801
SQMETRES	0.000259	0.000139	1.865696		0.0637
POOL	0.158991	0.388248	0.409509		0.6826
PROFIT	1.116960	0.409124	2.730124	***	0.0069
TENURE	-0.488736	0.074352	-6.573265	***	0.0000
METRO	0.570569	0.401087	1.422556		0.1565
ACT	-0.068154	0.870436	-0.078298		0.9377
NSW	0.472426	0.517743	0.912472		0.3627
SA	-0.606697	0.403479	-1.503666		0.1344
TAS	0.525115	0.582765	0.901075		0.3687
WA	0.671520	0.389949	1.722072		0.0867
GP	-0.000362	0.000180	-2.005253	*	0.0464
HOSPITAL	-0.000119	3.49E-05	-3.393363	***	0.0008
MEDCENTR	0.000116	0.000179	0.647354		0.5182

R-squared	0.401767	Mean dependent var	4.975369
Adjusted R-squared	0.350306	S.D. dependent var	1.928007
S.E. of regression	1.554043	Akaike info criterion	3.799625
Sum squared resid	449.1992	Schwarz criterion	4.077086
Log likelihood	-368.6619	F-statistic	7.807235
Durbin-Watson stat	2.125384	Prob(F-statistic)	0.000000

***Significant at α=.001 **Significant at α=.01 *Significant at α=.05

Structural Variables

The age of the property remains a significant driver of price, with increased age having a negative effect on price. The positive effect of a higher quality property receives additional support with units in a village operated on a for-profit basis selling for more than those in a village run on a not-for-profit basis. The number of bedrooms becomes insignificant in this model at the 5% level of significance, however would be a significantly positive effect at the 10% level, as would the measure of spaciousness in the village, the Square Metres variable.

Neighbourhood Variables

The positive effect of a metropolitan location on price receives additional support while in this model there is no significant difference in prices among different states.

Contract and Temporal Variables

All properties included in this sample gained legal title, therefore this variable is not included in the model. An increase in the deferred management fee charged to the resident when selling the property was shown to be a statistically significant negative effect on price. Tenure, the variable included to control for the time the transaction took place, was a significant driver of price, with an older transaction exhibiting a lower price.

Location Variables

Increased proximity to the nearest hospital was once again shown to have a positive effect on price, while the same was shown to be true for increased proximity to a General Practitioner. Proximity to a medical centre was not significant.

4.2.2 Study Two

Models four through seven employing data from study two show good explanatory power. The high R^2 figures can be attributed to the fact that the "catch-all" neighbourhood and locational amenity variable of median house price is included in all models. The statistically significant variables in models four through seven have mixed results when compared with the expected sign prior to analysis. Consistent variables include the increased distance to the nearest hospital has a significantly negative effect on price, increased size of the house having a significantly positive effect on price, the dummy variable indicating a new property (a proxy for building quality) has a significantly positive coefficient, and increases in the median house price have a significantly positive effect. The results of all four models are shown in the tables below. For a summary of the significant variables across both studies in one table see Section 4.3 on page 134.

Table 18: Results of Model Four

Dependent Variable: PRICE
Method: Least Squares
Sample (adjusted): 2 300
Included observations: 290 after adjustments
White heteroskedasticity-consistent standard errors & covariance

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-752994.7	121111.5	-6.217368	0.0000***
AGE	961.1143	586.1015	1.639843	0.1022
SIZE	2010.984	107.1943	18.76018	0.0000***
ATTACHED	29129.50	23430.85	1.243211	0.2149
NEW	127915.3	18772.47	6.813983	0.0000***
AREA_PER_HOME	-114.3286	56.57376	-2.020876	0.0443
FEES	1260.409	444.9230	2.832870	0.0050**
Q4_2010	14287.23	16088.32	0.888050	0.3753
Q1_2011	30608.60	15810.36	1.935984	0.0539
Q2_2011	27059.93	15997.60	1.691500	0.0919
Q3_2011	20768.13	16037.50	1.294973	0.1964
Q4_2011	10487.65	15853.16	0.661549	0.5088
Q1_2012	19683.06	15518.05	1.268397	0.2057
Q2_2012	1287.858	15698.74	0.082036	0.9347
Q3_2012	4461.913	15331.10	0.291037	0.7712
ED_MEDICAL_CENTRE	-20.26537	11.32170	-1.789957	0.0746
ED_HOSPITAL	-14.72747	1.872715	-7.864234	0.0000***
MEDIAN_HOUSE_PRICE	0.929260	0.124353	7.472773	0.0000***

R-squared	0.916819	Mean dependent var	404334.4
Adjusted R-squared	0.911620	S.D. dependent var	109538.6
S.E. of regression	32564.54	Akaike info criterion	23.67989
Sum squared resid	2.88E+11	Schwarz criterion	23.90768
Log likelihood	-3415.585	Hannan-Quinn criter.	23.77116
F-statistic	176.3506	Durbin-Watson stat	2.290233
Prob(F-statistic)	0.000000		

***Significant at α=.001 **Significant at α=.01 *Significant at α=.05

Table 19: Results of Model Five

Dependent Variable: LN_PRICE
Method: Least Squares
Sample (adjusted): 2 300
Included observations: 290 after adjustments
White heteroskedasticity-consistent standard errors & covariance

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	10.63583	0.279226	38.09037	0.0000***
AGE	0.001772	0.001138	1.557150	0.1206
SIZE	0.004848	0.000221	21.94718	0.0000***
ATTACHED	0.092000	0.054707	1.681675	0.0938
NEW	0.433495	0.043904	9.873767	0.0000***
AREA_PER_HOME	-0.000668	0.000142	-4.706893	0.0000***
FEES	0.001388	0.001095	1.266957	0.2063
Q4_2010	0.006490	0.029265	0.221759	0.8247
Q1_2011	0.060913	0.031887	1.910270	0.0571
Q2_2011	0.053015	0.031679	1.673503	0.0954
Q3_2011	0.044944	0.032210	1.395352	0.1640
Q4_2011	0.016741	0.030762	0.544213	0.5867
Q1_2012	0.037818	0.030947	1.222046	0.2227
Q2_2012	-0.014877	0.032096	-0.463512	0.6434
Q3_2012	0.007273	0.030678	0.237080	0.8128
ED_MEDICAL_CENTRE	-3.23E-05	2.68E-05	-1.205094	0.2292
ED_HOSPITAL	-3.85E-05	4.57E-06	-8.424161	0.0000***
MEDIAN_HOUSE_PRICE	1.77E-06	2.80E-07	6.320012	0.0000***

R-squared	0.915169	Mean dependent var	12.87766
Adjusted R-squared	0.909867	S.D. dependent var	0.248431
S.E. of regression	0.074584	Akaike info criterion	-2.293712
Sum squared resid	1.513091	Schwarz criterion	-2.065926
Log likelihood	350.5882	Hannan-Quinn criter.	-2.202449
F-statistic	172.6103	Durbin-Watson stat	2.435654
Prob(F-statistic)	0.000000		

***Significant at α=.001 **Significant at α=.01 *Significant at α=.05

Table 20: Results of Model Six

Dependent Variable: PRICE
Method: Least Squares
Sample (adjusted): 2 300
Included observations: 290 after adjustments
White heteroskedasticity-consistent standard errors & covariance

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-571104.2	93029.10	-6.138985	0.0000***
AGE	769.5100	561.5864	1.370243	0.1717
SIZE	2009.866	103.4262	19.43285	0.0000***
ATTACHED	38250.74	21079.22	1.814619	0.0707
NEW	126655.4	11251.90	11.25635	0.0000***
AREA_PER_HOME	-200.9707	49.71285	-4.042631	0.0001***
FEES	23.71062	390.3330	0.060745	0.9516
Q4_2010	12309.22	15752.11	0.781434	0.4352
Q1_2011	28211.55	15369.30	1.835579	0.0675
Q2_2011	24559.83	15572.19	1.577159	0.1159
Q3_2011	21789.57	15564.01	1.399997	0.1627
Q4_2011	10660.57	15355.44	0.694254	0.4881
Q1_2012	20027.31	15118.53	1.324686	0.1864
Q2_2012	3800.475	15131.70	0.251160	0.8019
Q3_2012	10894.57	14667.09	0.742791	0.4582
DD_MEDICAL_CENTRE	-8.915897	4.593298	-1.941067	0.0533
DD_HOSPITAL	-10.87615	1.171828	-9.281352	0.0000***
MEDIAN_HOUSE_PRICE	1.084039	0.061062	17.75313	0.0000***

R-squared	0.919915	Mean dependent var	404334.4
Adjusted R-squared	0.914910	S.D. dependent var	109538.6
S.E. of regression	31952.67	Akaike info criterion	23.64196
Sum squared resid	2.78E+11	Schwarz criterion	23.86974
Log likelihood	-3410.084	Hannan-Quinn criter.	23.73322
F-statistic	183.7878	Durbin-Watson stat	2.320422
Prob(F-statistic)	0.000000		

***Significant at α=.001 **Significant at α=.01 *Significant at α=.05

Table 21: Results of Model Seven

Dependent Variable: LN_PRICE
Method: Least Squares
Sample (adjusted): 2 300
Included observations: 290 after adjustments
White heteroskedasticity-consistent standard errors & covariance

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	11.02313	0.260730	42.27793	0.0000***
AGE	0.001460	0.001083	1.347876	0.1788
SIZE	0.004830	0.000212	22.74231	0.0000***
ATTACHED	0.102270	0.051215	1.996893	0.0468*
NEW	0.410767	0.030029	13.67901	0.0000***
AREA_PER_HOME	-0.000855	0.000142	-6.030877	0.0000***
FEES	-0.001569	0.001186	-1.323501	0.1868
Q4_2010	0.003432	0.028592	0.120047	0.9045
Q1_2011	0.057629	0.031007	1.858625	0.0642
Q2_2011	0.048150	0.030766	1.565065	0.1187
Q3_2011	0.049177	0.031151	1.578657	0.1156
Q4_2011	0.018201	0.029685	0.613145	0.5403
Q1_2012	0.039729	0.030064	1.321501	0.1874
Q2_2012	-0.006955	0.030702	-0.226514	0.8210
Q3_2012	0.023148	0.029469	0.785507	0.4328
DD_MEDICAL_CENTRE	-1.89E-05	1.30E-05	-1.448782	0.1486
DD_HOSPITAL	-2.65E-05	2.71E-06	-9.784612	0.0000***
MEDIAN_HOUSE_PRICE	2.32E-06	1.37E-07	16.89911	0.0000***

R-squared	0.916568	Mean dependent var	12.87766
Adjusted R-squared	0.911353	S.D. dependent var	0.248431
S.E. of regression	0.073967	Akaike info criterion	-2.310338
Sum squared resid	1.488141	Schwarz criterion	-2.082552
Log likelihood	352.9990	Hannan-Quinn criter.	-2.219076
F-statistic	175.7724	Durbin-Watson stat	2.460946
Prob(F-statistic)	0.000000		

***Significant at α=.001 **Significant at α=.01 *Significant at α=.05

The inconsistent variables include the weekly fees charged, where increases actually have a significantly positive effect on price and the spaciousness variable (area per home) which was expected to have a positive effect but indeed shows a consistently significant negative effect. The variance inflation factors for area per home in models five and seven, where the dependent variable is the log of price, indicate multicollinearity and so these coefficients may be invalid. It is important to note that the presence of multicollinearity will not affect the validity of the entire model nor cause the coefficient estimators to be biased or inefficient (Jaccard et al., 1990).

Due to the consistency of the results, the findings of models four through seven are discussed together in the following sections.

4.2.2.1 Structural Variables

The size of the property in square meters shows a significantly positive effect on price in both the natural and logarithmic form. This is consistent with expectations and indeed shows a strong connection through the pricing models implemented by developers in the industry. Common practise is for developers to price their housing stock based upon a rate per square meter when first releasing the houses to the market. In one of the subject developments (coded SA) the sales sheets show pricing ranging from $2,500 per square meter to $3,100 per square meter. Development SA is one of the more expensive developments in the area. Model Four shows a premium of $2,010 per additional square meter, significant at the 1% level of significance, while model six shows a premium of $2,009 per additional square meter, also at the 1% level of significance.

Model seven shows the attached nature of a unit to have a significant effect on the natural log of price, but this factor is not reflected in any of the other three models. The variable included as a proxy for building quality, the dummy variable indicating if the house was new when purchased, has consistent support in having a significantly positive effect on price. Models four and six indicate a new property transacts at a premium of approximately $127,000 to a used property.

The spaciousness variable was initially estimated to have a positive effect on price, however the results indicate increased spaciousness has a negative effect on price. The exact influence should be treated with caution as the variable exhibits multicollinearity in models five and seven (with high variance inflation factors for models four and six, even though they do not breach the suggested threshold). This could be explained by the fact that one of the qualitative drivers of choice to move into retirement-specific housing identified in prior research is a desire to simplify, to reduce gardening and housing maintenance (Gardner, 1994). This desire may result in a perception that higher density living is more desirable as an attribute of retirement housing. Certainly these results provide support for this argument.

4.2.2.2 Contract and Temporal Variables

The weekly rental fees paid by owners of the retirement houses to occupy the land in the over-50s lifestyle village receives partial evidence to suggest it may have a positive effect on price. Model four indicates that every additional dollar of weekly fees increases the price of a retirement house by $1,260. The other three models show no support with differences of sign evident in the coefficients. This, coupled with the relatively high variance inflation factor of 7.92, suggests the result should be viewed with some caution. The quarterly time dummy variables are estimated to account for temporal influences ion price.

4.2.2.3 Neighbourhood and Locational Variables

The three factors addressing neighbourhood and locational amenity are the median house price variable and the two distance to medical services variables. The median house price variable is a "catch-all", acting as a representation of the collective impact of neighbourhood and locational amenity on the price of the house. This approach was forced upon the research due to the clustered nature of the data. While reducing the breadth of the explanatory power of the pricing model, it allows an examination of medical proximity. The median house price variable is significantly positive in all four models at the 1% level of significance.

Medical proximity is measured in two ways: distance to the nearest medical centre and distance to the nearest hospital. The distinction is made to differentiate between higher and lower order services, acknowledging that the amount of utility provided by the different categories of medical facilities may alter and therefore influence the potential effect on the purchase of proximal retirement housing. All four models indicate a negative relationship between increased distance and price, but none finds the relationship to be statistically significant. Models four and six show P-values of 0.0746 and 0.0533 respectively, which are not significant at the 5% level of significance but would satisfy a 90% confidence level. Such results are not considered robust enough for this research.

Proximity to the nearest hospital impacting the price a consumer is willing to pay for retirement-specific housing receives support from all four models. Models four and six state the premium paid for every meter of increased proximity ranges between $14.73 ($14,727/km or $8,952/mile) for Euclidean distance and $10.88 ($10,876/km or $6,611/mile) for driving distance. The mean Euclidean distance to the nearest hospital in the sample is 7,797 meters, implying the average unit is priced at a discount of $114,850 to a theoretical unit that is collocated with a hospital. When measuring proximity using driving distance where the mean distance is 12,027 meters, the implied effect is a discount of $130,853.

In logarithmic form, the impacts are still significant at the 1% level of significance for distance to the nearest hospital. Model five states that for every kilometre of increased distance a retirement house's price declines 3.85%. while model seven where driving distance is used the figure is 2.65%.

4.3 *Summary and Test of the Hypotheses*

The results of the models across studies one and two provide important information relating to the pricing of retirement-specific housing in Australia. The significant variables are summarised in Table 22 below.

Proximity to a hospital is a significant determinant of the price a purchaser is willing to pay for retirement housing in Australia. Consistent with Retain Location Theory, the higher-order medical services offered by a hospital are shown to derive enough utility for consumers to drive consumption decisions and therefore price. As hypothesised in H1, proximity to a hospital does significantly influence the price a consumer is willing to pay for a retirement-specific house: purchasers will pay a premium for proximity to a hospital. H1 receives support from all seven models across both studies.

The hedonic regressions do not provide support for H2: this research does not support the notion that proximity to a medical centre significantly influences the price of retirement-specific housing. H3 receives support from the categorical data included in model three in study one, showing a positive effect on price for proximity to a general practitioner's office, but not from models one and two. Due to the potential reliability issues with the categorical price data used in model three, this result should be treated with caution.

Although included for control purposes in this research, the other independent variables provide valuable insight into the factors that significantly drive consumption decisions for retirement-specific housing. In particular the age of the property, number of bedrooms and size, general quality of the retirement village, gaining legal title through the purchase contract, a metropolitan location and a location in New South Wales as compared to Victoria are shown to be positive influences of retirement village unit prices while a location in Tasmania receives support as a negative influence on price. Partial support is shown for the overall spaciousness of a village positively influencing price in study one while the results in study two signify a negative relationship. On a contractual basis, increased deferred management fees were shown to decrease price.

Table 22: Summary of Significant Variables

	Study One			Study Two			
Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
Age	-*	-*	-***				
Bedrooms	+***	+***	+***				
Size				+***	+***	+***	+***
Pool	+***	+***					
For Profit	+*	+***	+***				
New				+***	+***	+***	+***
Attached							+*
Area per Home					-***	-***	-***
Metro location	+***	+***					
Deferred Management Fee			-***				
Weekly Rental Fees				+**			
Median House Price				+***	+***	+***	+***
Distance to GP			-*				
Distance to Hospital	-*	-***	-***				
Euclidean Distance to Hospital				-***	-***		
Driving Distance to Hospital						-***	-***

*Sign indicates direction of effect, * significant at α=.05, ** significant at α=.01, *** significant at α=.001*

5 Chapter Five: Conclusion

This study contributes to the body of knowledge concerning consumption decisions for residential real estate in general, and retirement-specific housing in particular. The study finds that increased proximity to a hospital is a significantly positive driver of the price a purchaser is willing to pay for a retirement-specific house. Weak support is shown for proximity to a general practitioner having a positive influence on price. There is no support for proximity to a medical centre influencing price. The study further finds support for the size and quality of the housing being a significantly positive effect on price. These findings may impact researchers and practitioners alike.

5.1 *Theoretical Implications*

Cross-disciplinary research can often inform a researcher's thought processes and shed light on a particular way in which to view a research question. Such is the case with this study: theoretical foundations drawn from the fields of marketing (Retail Location Theory) and economics (Hedonic Pricing Theory) were combined to examine qualitative research findings in the field of gerontology (retirement housing preferences) in a new way.

Christaller (1933) and Losch's (1940) early work on Central Place Theory receives further support from this research. Their central tenet that demand for a good or service will decline with geographic distance from its point of consumption is confirmed by the result of this study. Further, the theory postulates that expensive, infrequently purchased (higher order) goods or services will draw consumers from a larger geographic range: the increased consumer amenity provided by the good or service will overcome the additional costs of increased distance to travel for consumption. The services offered by hospital can be generally considered to be higher order in nature, certainly in relation to those offered by the local doctor or allied health professional in a medical centre. This study shows support for the higher order service driving consumption decisions while the lower order services not showing a significant effect and is consistent with the theoretical foundation.

The results of the hedonic regressions add support to the generally accepted set of factors that significantly influence the price of residential real estate. The effect of increased age, bedrooms and lot size are consistent with the consensus of previous research, as is the inclusion of a swimming pool and the proxy used for the overall quality of the property (Kim, 2003). Even though these results appear merely confirmatory in nature, the contribution of this research is in the extension of the theory to retirement-specific housing. The extant literature has not examined the factors driving price for retirement-specific housing using hedonic regression to arrive at implicit prices for the factors themselves.

The identification, and implicit pricing, of proximity to a hospital having a significantly positive effect on retirement-specific housing is unique in the literature and may constitute a basis for identifying retirement-aged consumers as a moderating factor on the generally accepted hedonic pricing model for residential real estate. As the world's population gradually ages, access to health-related services will become an increasingly important issue and is attracting significant research activity. This study may form a basis from which to extend existing research techniques into understanding how best to provide quality of life for the ageing population.

5.2 *Policy Implications*

Recent government policy initiatives have shown an increased interest on behalf of the government in reducing homelessness and increasing the availability of affordable and social housing. The National Rental Affordability Scheme, Social Housing Initiative and National Partnership Agreement on Homelessness are all designed to achieve these goals.

This study has implications for government and town planners by adding to the body of knowledge supporting policy related to the provision of housing and care to the ageing population. Additionally, the results have the potential to inform decisions regarding zoning and placement of retirement-specific housing and site selection processes for development of retirement villages. With general populations increasing, the need for efficient land use is becoming an issue of increasing importance (Daniels, 2001).

In Section 1.4 on page 35 the question of how to provide care in a service integrated housing setting was posed. Three options were slated: a captive model, an outsourced subcontractor model, and a proximal model.

This research has identified that purchasers of retirement village units will pay a significant premium for proximity to a hospital, with weak support for a positive relationship with proximity to a general practitioner's office.

The impact of these results is informative for policy determination. There is evidence to suggest appropriately located retirement villages can assist in the provision of care to the ageing population. Co-location is consistent with the current policy of shifting care away from institutions and into the community, and allows for effective utilisation of fixed care resources. In this respect, costs that may have been born by the government under Home and Community Care packages may instead be replaced with just the costs involved in travel to the facilities borne by the residents.

The results lend support to the significance of service integrated housing as a valid channel for delivering care. Industry participants claim service integrated housing is often neglected during policy deliberation and determination (Jones et al., 2010), and this study may assist government in making more informed policy decisions in relation to this topical issue.

There are calls to examine the issue of deteriorating housing affordability. In the United States the National Association of Realtors states "there is a continuing, growing crisis in housing affordability and homeownership that is gripping our nation" (NAOR, 2001), while the National Association of Home Builders claims "America is facing a silent housing affordability crisis (NAHB, 2002)."

The ratio of housing costs to income is typically regarded as a common measure of housing affordability (Stone, 2006). Housing costs include factors such as the physical costs of land acquisition and construction as well as governmentally-imposed restrictions on building such as zoning. Research indicates that zoning decisions may have more to do with reduced housing affordability than the physical costs of construction (Glaeser & Gyourko, 2003).

Knowledge of the factors that derive utility for purchasers of particular categories of property can assist local and state governments in devising effective master town plans and informing local zoning decisions. Significant effort is made by authorities to develop efficient, effective cities and towns for residents. Continued research into the identification of the relationships contributing to consumption decisions can only serve to increase the efficacy of current and future planning decisions, aligning the zoning of property with its highest and best use, and contributing to the overall goal of improving housing affordability.

5.3 *Industry Implications*

It is claimed that the more serious complaints levelled against retirement village operators relate to the provision of health care supports (Stimson, 2002; Wolcott & Glezer, 2002). Further to this, an opportunity appears to be opening up for higher levels of care in a retirement village-based setting as opposed to residential aged care. Shifts in the residential aged care industry have seen upwards of 75% of residents classified as high care and just 25% as low care (Jones et al., 2010).

Jones' paper asks *"how can the provision of service integrated housing for older people be advanced?"* (p.8). One option is for retirement villages to increase their provision of care or partner with residential aged care facilities nearby in order to take advantage of this opportunity. The results of this study indicate that retirement village purchasers do in fact value the provision of health care services, and will pay a premium for increased availability of such services, especially if they are of a higher order such as hospital-based services. This lends support to the decision of some operators to offer higher order medical services within the village. The results of this study indicate those villages should be more highly valued than a similar village that does not offer the services.

Kendig and Gardner's (1997) call for linkages between retirement housing and provision of care receives support by this research. Such proximity is shown to be a preference of retired consumers which translates into their pricing decision. This is further support for the co-location argument proposed for the provision of care services for service integrated housing, as discussed by Jones et al. (2010).

Similarly, developers of retirement-specific housing will be able to target their future developments more accurately, building a product that is more in line with consumer preferences. This will match the costs of the development more closely with the factors that derive utility for the end consumers, providing for a product that consists of factors for which the purchasers are actually willing to pay. These costs include a more informed decision based on Bid-Rent Theory as to the particular premium a developer should pay for a better located development site. This more efficient pricing regime will assist in providing more affordable retirement housing.

The significance of the value attributed to hospital proximity by purchasers of retirement housing should not be understated. Similarly, the insignificance of proximity to medical centers is particularly revealing. The results of study two suggest each kilometre of Euclidean proximity to a hospital adds $14,727 to the price a purchaser of retirement-specific housing is willing to pay, while proximity in driving distance attributes $10,876 per kilometre. The insignificance of proximity to medical centres may reflect expectations by contemporary consumers that lower-order medical services be delivered into the villages, as is the practise in many of today's more progressive retirement communities.

The research will also inform retirement village operators' decisions about upgrades and redevelopment decisions. This study suggests, for example, that each additional year of age of a retirement village unit reduces its price by $1,076.98. This information can inform a capital budgeting decision as to when might be the appropriate time to redevelop a particular village. The $27,162 price premium attributed by the model to the existence of a swimming pool along with the significantly positive "New" variable, (both used as a proxy for overall quality), provides an insight into the extent to which purchasers value higher quality developments and calls for more research in this area to more accurately identify the components of this aggregated attribute. From a legal structure point of view, model one indicates a preference for purchasers gaining title to the property, assisting developers in determining the details of their occupancy documentation.

In addition to the attributes found to be significant in the pricing model, information regarding insignificant attributes is equally interesting. The extent of the deferred management fee was only shown to be a significantly negative effect on price in model three, using aggregated categorical data. When incorporating historical or current purchase prices the deferred management fee was shown not to influence the pricing decision. Similarly, increased land size of the development relative to the number of retirement village units was not shown to have an effect on price.

Finally, the Australian retirement village industry is going through a period of consolidation of ownership by large corporate owner/operators. Firms such as LendLease, FKP, Macquarie and Stockland are all contributing to the consolidation of the increasingly privatised industry. Many not-for-profit operations are being acquired by for-profit firms. The results of this study provide valuable information for these industry participants, indicating potentially effective ways of delivering value to unit owners and, ultimately, the operators themselves.

5.4 *Future Research*

This research provides an initial insight into the pricing of retirement-specific housing. One specific source of amenity is studied, that of proximity to medical facilities, however despite the high explanatory power exhibited by the hedonic pricing models developed in this study it is virtually guaranteed that other location-based drivers of amenity exist. The research could be extended by examining the effect of other location-based drivers identified in previous residential real estate studies as significant influences on price that may be considered to exhibit different level of preference in retirement-aged people compared to the general population. such amenities could include the following, provided with relevant journal articles to guide the research:

- Retail proximity (Song & Sohn, 2007)
- Public transport proximity (Strand & Vagnes, 2001)
- Environmental amenity (e.g. beach, lake, open spaces) proximity (Brown & Pollakowski, 1977; Powe, et. al., 1997)

A great deal of the data collected for this study was qualitative in nature. There is a call in the field of hedonic pricing to incorporate the use of geographic information systems (GIS) into the research design. A GIS allows for exact spatial measurements when incorporating distance-dependent characteristics in hedonic price models, using latitude and longitude data to precisely locate particular transactions and related factors. Such a system can incorporate exacting accuracy into the data used for pricing purposes. It is no wonder, therefore, that research incorporating GIS is achieving significantly improved fit, with hedonic models being shown to improve by approximately twenty per cent when utilising GIS-based independent variables (Thibodeau, 2002). An extension of this research would be to examine a defined marketplace and replicate the study, using GIS-based data for the distance-based data instead of the perceptual data used in this study.

Additionally, the data used in study one was deliberately sourced from prior to the Global Financial Crisis the world has experienced since 2007. According to the S&P Case Shiller Composite 20 Home Price Index, which measures changes in the residential real estate market in twenty metropolitan cities across America, average house prices fell 27.8% between January 2007 and August 2009 (Standard and Poors, 2009). This type of infrequent external shock to a marketplace can bias the fundamental relationship between underlying factors and price, confounding the results of any analysis. While the data in study two is current and provides confirmation of the results found in study one, it is from a defined geographic location in south east Queensland and derives its information from twelve different sites. As discussed in the methodology section, a broader collection of data to enable greater generalizability and to reduce the multicollinearity issues that were evident from study two's clustered data set would add to the depth of understanding of this important research question.

5.5 *Limitations of the Research*

This is an empirical study and consequently suffers from several limitations. The limitations can be categorised as limits of the study and those relating to the methodology used.

5.5.1 Study Limits

Study one introduces limits of three different types: interest bias, perceptual bias, and the fact that the data is predominantly cross-sectional in nature. Interest or response bias occurs when only those respondents who are interested in the research return the sampling instrument, potentially introducing bias into the sample data. The response rate in study one exceeded 50%, reducing the potential for this bias, however it remains as a limitation of the study. It is suggested this issue is not of large concern (Shadish et al., 2002).

Many of the questions used to collect the data in study one required the respondents to give their opinion. As an example, the questions used to garner the distance information for the medical proximity variables asked the respondents “What is the approximate distance (please specify in metres) from your village to the following.” The data gleaned from these responses is reliant on the respondents’ perception of the distance and will almost certainly introduce measurement bias into the data, limiting the potential validity of the regression results.

The price data used to calculate the implicit prices of the independent variables is cross-sectional in nature: it was recorded at a single point in time. Historical data was also collected in the form of the entry price in study one, however this data was categorical and unable to be used to determine implicit prices. Cross-sectional data suffers from the fact that it is dependent upon the particular set of circumstances surrounding the measured good at the point of time of data collection. The results from analysing such data may be biased to the particular circumstances of the time, and not necessarily relate to the general relationship over time. It was for this reason that two studies were performed. The pre-GFC data in study one is complemented by the data collected in 2012 for study two. The confirmation of results between the two studies attempts to overcome some of the cross-sectional data concerns.

5.5.2 Method Limits

Two method limits exist in this study: the assumption of a linear relationship between the explanatory variables and price, and the definition of the marketplace. Debate continues in the field of hedonic price modelling as to which functional form best fits the true relationship observed in the population. The heterogeneity of a house as an asset suggests a non-linear relationship between its price and its explanatory variables (A. M. Freeman, III, 1993), however evidence suggests simple linear models perform best with respect to fit (Sirmans et al., 2006). Consensus has not been reached, however a significant number of researchers are choosing the simplicity of linear models over their non-linear counterparts.

To control for geographically-related differences, it is suggested that residential house price analysis be confined to individual sub-markets (Palm, 1978). This research approaches this issue from two points of view. Study one attempts to establish a base from which to guide future research and consequently collected data Australia-wide in order to increase the ability to generalise the results. The geographic differences were controlled through various control variables, however it is likely that geographic differences exist in the data and will limit the ability to interpret the results.

Study two limited data collection to a defined geographic location in south east Queensland to see if the results found in the nation-wide study were mirrored in an individual submarket. Significant confirmation was seen with respect to medical proximity and retirement housing price. T combined studies provide support for the statement that proximity to a hospital is a significant determinant of price for retirement-specific housing in Australia.

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6.1 *Appendix One:McGovern and Baltins (2002) 'The Retirement Village Industry in Australia: Evolution and Structure'. In Stimson, R. (ed.) The Retirement Village Industry in Australia: Evolution, Prospects, Challenges. Brisbane: Centre for Research into Sustainable Urban and Regional Futures, University of Queensland, 23-46*

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6.2 *Appendix Two: Independent Resident Survey*

Office Use Only:

1. In which age group were you and your spouse or de facto (if applicable) when you retired from the workforce? ***(please circle one response in each column)***

You		**Your spouse/de facto**	
(a)	39 years and under	(a)	39 years and under
(b)	Between 40 and 44	(b)	Between 40 and 44
(c)	Between 45 and 49	(c)	Between 45 and 49
(d)	Between 50 and 54	(d)	Between 50 and 54
(e)	Between 55 and 59	(e)	Between 55 and 59
(f)	Between 60 and 64	(f)	Between 60 and 64
(g)	Between 65 and 69	(g)	Between 65 and 69
(h)	Between 70 and 74	(h)	Between 70 and 74
(i)	75 years and over	(i)	75 years and over
(j)	Have not retired	(j)	Has not retired
		(k)	Not applicable

2. Throughout your life what is/was your main occupation (and that of your spouse/de facto)? ***(please circle one response in each column)***

You		**Your spouse/de facto**	
(a)	Professional	(a)	Professional
(b)	Agricultural worker	(b)	Agricultural worker
(c)	Trades/Labourer/Manufacturing	(c)	Trades/Labourer/Manufacturing
(d)	Service industry worker	(d)	Service industry worker
(e)	Administration/clerical/secretarial	(e)	Administration/clerical/secretarial
(f)	Home duties	(f)	Home duties
(g)	Pension/benefit	(g)	Pension/benefit
(h)	Other	(h)	Other
		(i)	Not applicable

3. What is your highest educational attainment (and that of your spouse / de facto)? ***(please circle one response in each column)***

You

(a) Started primary school
(b) Completed primary school
(c) Junior certificate at secondary school
(d) Senior certificate at secondary school
(e) Certificate
(f) Diploma / Associate Diploma
(g) Bachelor degree
(h) Higher than bachelor degree
(i) None of the above

Spouse/ de facto (if applicable)

(a) Started primary school
(b) Completed primary school
(c) Junior certificate at secondary school
(d) Senior certificate at secondary school
(e) Certificate
(f) Diploma / Associate Diploma
(g) Bachelor degree
(h) Higher than bachelor degree
(i) None of the above
(j) Not applicable

4. What is the name of the village you currently live in?

____

5. What is the postcode area and the name of the suburb or town where this retirement village is located?

__ __ __ __ (Postcode) ____________________(Suburb or town)

6. How long have your lived in this retirement village? ***(please circle one response)***

(a) Under 6 months
(b) Between 6 months but less than 12 months
(c) Between 1 year but less than 4 years
(d) Between 4 years but less than 8 years
(e) Between 8 years but less than 12 years
(f) 12 years or more

7. Immediately before moving into this retirement village, were you ***(please circle one response)***

(a) Living with a family member or friend in their home

(b) Living on your own or with your spouse / de facto / friend in a home that you owned or rented

(c) Living in another retirement village

(d) Other (please specify:________________________________)

8. How many retirement villages apart from this one have you lived in? ***(please circle one response)***

(a) No other villages (go to question 10)

(b) One or more

9. Please write the suburb or town and give the postcode where every one of these previous villages were located. Also, write the year you moved into and left each of these villages.

Village	Suburb/Town	Postcode	Year moved in	Year moved out
1				
2				
3				
4				
5				
6				

10. What was your age and the age of your spouse / de facto (if applicable) when you moved into your first retirement village?

(a) Your age _______years (b) The age of your spouse / de facto______years

11. Prior to moving into your first retirement village, what was the area postcode, suburb or town and state or territory of your last permanent home that you owned or rented?

__ __ __ __ (Postcode) ___________________________(Suburb or town)

12. Approximately how many kilometres away was your last permanent home from where you now live? ***(please circle one response)***

(a) Less than 1 kilometre
(b) Between 1 and 4 kilometres
(b) Between 5 and 9 kilometres
(c) Between 10 and 19 kilometres
(d) Between 20 and 49 kilometres
(e) Between 50 and 99 kilometres
(f) Between 100 and 199 kilometres
(g) Between 200 and 499 kilometres
(h) Over 500 kilometres

13. What type of dwelling was your last permanent home before moving into your first retirement village? ***(please circle one response)***

(a) House
(b) Townhouse
(c) Unit/flat
(e) Caravan/mobile home
(f) Other (please specify:______________________________)

14. Did you own or rent that last permanent home? ***(please circle one response)***

(a) Owned it outright
(b) Paying off a mortgage
(c) Private rental (go to question 17)
(d) Public housing rental (go to question 17)
(e) Other (please specify:__________________) (go to question 17)

15. Do you still own that home? ***(please circle one response)***

(a) Yes (go to question 17)
(b) No

16. For much did you sell that home? ***(please circle one response)***

(a) $0 - $99,999
(b) $100,000 - $149,000
(c) $150,000 - $199,999
(d) $200,000 - $299,000
(e) $300,000 -$399,000
(f) $400,000 - $499,999
(g) $500,000 - $999,999
(h) $1,000,000 and over

17. How many storeys was that home? ***(please circle one response)***

(a) One storey
(b) More than one storey

18. Do you (or the person you live with) currently own and drive a car? ***(please circle one response)***

(a) Yes
(b) No

19. Here is a list of reasons why people decide to leave the permanent home which they lived in before moving into their first retirement village. Please indicate by ticking yes to those reasons which prompted your move from home. Tick the 'no' column for those reasons that did not prompt you to move from your home.

	Reason	**Yes**	**No**
(a)	Did not feel secure in previous home		
(b)	Previous home was too expensive to maintain		
(c)	The garden at my previous home was too big		
(d)	The design of my previous home was inappropriate (eg. stairs)		
(e)	Previous home was too difficult to maintain		
(f)	Wanted a change in lifestyle		
(g)	Wanted more free time		
(h)	Health reasons / required more assistance		
(i)	Death of spouse (or person I was previously living with)		
(j)	Children / family / friends moved out of home		
(k)	Wanted to be closer to family, relatives and friends		
(l)	Wanted to spend more time with people of similar backgrounds to mine		
(m)	Was lonely		
(n)	Could no longer drive		
(o)	Had recently stopped working		
(p)	Other (please specify:)		
(q)	Other (please specify:)		
(r)	Other (please specify:)		

20. Go through this list of reasons and this time circle the single most important reason that made you decide to leave that home and move to a retirement village. ***(please circle one response)***

(a) Did not feel secure in previous home

(b) Previous home was too expensive to maintain

(c) The garden at my previous home was too big

(d) The design of my previous home was inappropriate (eg. stairs)

(e) Previous home was too difficult to maintain

(f) Wanted a change in lifestyle

(g) Wanted more free time

(h) Health reasons / required more assistance

(i) Death of spouse (or person I was previously living with)

(j) Children / family / friends moved out of home

(k) Wanted to be closer to family, relatives and friends

(l) Wanted to spend more time with people of similar backgrounds to mine

(m) Was lonely

(n) Could no longer drive

(o) Had recently stopped working

(p) Other (please specify:______________________________)

21. Who or what influenced you to move into a retirement village as opposed to alternative housing or staying in your home? ***(you may circle more than one of the following responses)***

(a) I visited a village previously and it appealed to me

(b) A family member / friend lives or once lived in a retirement village

(c) Family and / or friend lives in this retirement village

(d) I was influenced by advertising

(e) Word of mouth

(f) Family / friends influence

(g) Other (please specify:______________________________)

22. Before deciding upon moving into a retirement village, which of the following types of housing or living arrangements did you consider moving to? ***(you may circle more than one of the following responses)***

(a) Purchase a flat, unit or a smaller house

(b) Rent a flat, unit or smaller house

(c) Share with family/friends

(d) Move to public housing accommodation

(e) Stay in home but seek home help (eg. Meals on Wheels, Blue Nursing)

(f) Move into a self care unit (not in a retirement village)

(g) Move into a serviced apartment

(h) Move into a supported residential service/facility

(i) Move into a hostel

(j) Move into a nursing home

(k) Other (please specify:________________________________)

(l) I did not investigate any other alternatives

23. How long did you have to wait to get into this village? ***(please circle one response)***

(a) No wait

(b) Under 1 month

(c) Between 1 month but less than 3 months

(d) Between 3 months but less than 6 months

(e) Between 6 months but less than 12 months

(f) Between 1 year but less than 2 years

(g) Between 2 years but less than 5 years

(h) Over 5 years

24. Do visitors regularly stay overnight in your unit (few times per month)? ***(please circle one response)***

(a) Yes

(b) No

25. Please rank your top five reasons (with 1 being the main reason and 5 being the fifth most important reason) why you chose this retirement village as opposed to another village?

Reason		**Rank**
(a)	There were vacancies here	
(b)	I could afford the entry contribution and regular service payments	
(c)	The services / facilities provided on site	
(d)	Close to public transport	
(e)	Close to family and friends	
(f)	Close to services and facilities that I use in the local area	
(g)	The staff and other residents	
(h)	The design / size of the units	
(i)	The design / layout of the village	
(j)	I was already living in the area	
(k)	It is close to public transport	
(l)	It is near recreational and social activities	
(m)	It is on flat land – no hills	
(n)	Near to the coast / water	
(o)	There is a village bus	
(p)	Climate	
(q)	It is the area I lived in for a long time	
(r)	It is an area I got to know and like by going on holidays	
(s)	Other (please specify:________________________________)	

26. What tenure arrangement did you enter into on the unit you currently occupy? ***(please circle one response)***

(a) Strata / freehold title

(b) Loan and License

(c) Leasehold

(d) Company Title

(e) Rental Agreement

(f) Other (please specify:________________________)

(g) Not sure

27. The services and facilities that are provided in a retirement village are important factors to consider when deciding which village to move into. Here is a typical list. Think back to when you were choosing a suitable retirement village. Place a tick in the column that best describes how desirable it was for a village to contain each particular service and facility listed below.

Facility/Service	**Very desirable**	**Desirable**	**Neither desirable or undesirable**	**Not desirable**	**Very undesirable**
(a) Community centre					
(b) Library					
(c) Games/Craft rooms					
(d) Workshop					
(e) Pool/spa					
(f) Gym					
(g) Bowls					
(h) Golf/putting green					
(i) Tennis court					
(j) BBQ area					
(k) Village bus					
(l) Organised social activities					
(m) Storage areas for boats/caravans					
(n) Internet facilities					
(o) Workshop					
(p) Lock up garage					
(q) 24 emergency call system					
(r) Serviced apartments on site					
(s) Hostel on site					
(t) Nursing home on site					
(u) Reputable management/staff					
(v) Other (please specify:)					
(w) Other (please specify:)					
(x) Other (please specify:)					
(y) Other (please specify:)					

28. Please place a tick in the column that best describes how frequently you currently use each particular service and facility listed below in this village.

Facility/Service		**Very frequently (4-7 times/wk)**	**Frequently (1-3 times/wk)**	**Occasion-ally (few times/mth)**	**Infrequently (once/mth)**	**Not at all**	**Not provided in this village**
(a)	Community centre						
(b)	Library						
(c)	Games/Craft rooms						
(d)	Workshop						
(e)	Pool/spa						
(f)	Gym						
(g)	Bowls						
(h)	Golf/putting green						
(i)	Tennis court						
(j)	BBQ area						
(k)	Village bus						
(l)	Organised social activities						
(m)	Internet facilities						
(n)	Residents Workshop						

29. Should you require care, what level or levels of care do you intend to use? ***(you may circle more than one of the following responses)***

(a) Serviced apartments

(b) Supported residential facility/service

(c) Hostel

(d) Nursing home

(e) Care within my independent living unit

(f) Other (please specify:________________________________)

(g) I have not given it much thought/uncertain

30. What types of higher level care are provided in this village? ***(you may circle more than one of the following responses)***

(a) Serviced apartments

(h) Supported residential facility / service

(b) Hostel

(c) Nursing home

(d) Care within independent living units

(e) No higher level care is provided in this village (go to question 32)

(f) Don't know

31. How important was the fact that higher level care was available in this village contribute to your decision to move into this village? ***(please circle one response)***

(a) Very important (go to question 33)

(b) Important (go to question 33)

(c) Not important / Did not contribute to my decision (go to question 33)

32. Since higher level care is not provided on-site in this village, does the village have close affiliations with providers of higher level care accommodation that is located off site but in close proximity to this village? ***(please circle one response)***

(a) Yes, and it influenced my decision to move to this village

(b) Yes, but it did not influence my decision to move to this village

(c) No

(d) Not sure

33. How did you finance your move into this retirement village? ***(you may circle more than one of the following responses)***

(a) The sale of my previous home

(b) The sale of another property

(c) Liquidation of stocks or shares

(d) Superannuation payout

(e) Personal cash savings

(f) Government assistance (please specify:________________________________)

(g) Other (please specify:____)

34. What was the approximate entry contribution (the lump sum amount) you paid to enter this village? ***(please circle one response)***

(a) I paid no entry contribution – I am renting my unit

(b) Between $1 and $49,999 (go to question 36)

(c) Between $50,000 and $74,999 (go to question 36)

(d) Between $75,000 and $99,999 (go to question 36)

(e) Between 100,000 and $124,999 (go to question 36)

(f) Between $125,000 and $149,999 (go to question 36)

(g) Between $150,000 and $174,999 (go to question 36)

(h) Between $175,000 and $199,999 (go to question 36)

(i) Between $200,000 and $249,999 (go to question 36)

(j) Between $250,000 and $299,999 (go to question 36)

(k) Between $300,000 and $399,999 (go to question 36)

(l) Over $400,000 (go to question 36)

(m) Don't know / can't recall (go to question 36)

35. If you currently rent your unit, how much rent to you pay on a fortnightly basis? ***(please circle one response)***

(a) Between $1 and $99 per fortnight

(b) Between $100 and $199 per fortnight

(c) Between $200 and $299 per fortnight

(d) Between $300 and $399 per fortnight

(e) Between $400 and $499 per fortnight

(f) Over $500 per fortnight

36. What base service fee do you pay on a fortnightly basis? (The service fee usually covers operation and maintenance of common facilities within the village, management costs, building insurance etc.) ***(please circle one response)***

(a) Between $0 and $99 per fortnight

(b) Between $100 and $149 per fortnight

(c) Between $150 and $199 per fortnight

(d) Between $200 and $249 per fortnight

(e) Between $250 and $299 per fortnight

(f) Over $300 per fortnight

(g) I don't pay a service fee

37. If you could not afford the entry contribution or have difficulty paying the service payments, does this village offer affordable alternatives (such as paying less now but paying a higher exit fee)? ***(please circle one response)***

(a) Yes

(b) No

(c) Not sure

38. Approximately how many independent living units are in this village? ***(please circle one response)***

(a) Between 1 and 19

(b) Between 20 and 49

(c) Between 50 and 99

(d) Between 100 and 149

(e) Between 150 and 199

(f) Between 200 and 249

(g) Between 250 and 299

(h) Between 300 and 349

(i) Between 350 and 399

(j) Over 400 units

(k) Don't know

39. Do you think there are too many, too few or just the right number of independent living units in this village? ***(please circle one response)***

(a) Too many

(b) Just right

(c) Too few

40. How many bedrooms are in your unit? ***(please circle one response)***

(a) 1

(b) 2

(c) 3

(d) 4 or more

41. Who lives in your unit with you on a permanent basis? ***(please circle one response)***

(a) Just myself

(b) Spouse / de facto

(c) Friend / relative

(d) Acquaintance

42. Please tick the gender of each person living in your household (that is, your unit) on a permanent basis.

Occupant	Male	Female
(a) You		
(b) Occupant 2		
(c) Occupant 3		
(d) Occupant 4		

43. On average, what is the net income of persons in your household? Weekly, fortnightly, monthly and yearly figures are presented to assist you to choose the correct income bracket. Please indicate the correct row in the table below.

	Weekly	Fortnightly	Monthly	Yearly
(a)	$0 - $39	$0 - $79	$0 - $159	$0 - $2,079
(b)	$40 - $79	$80 - $159	$160 - $319	$2,080 - $4,159
(c)	$80 - $119	$160 - $239	$320 - $479	$4,160 - $6,239
(d)	$120 – $159	$240 - $319	$480 - $639	$6,240 - $8,319
(e)	$160 – $199	$320 - $399	$640 - $799	$8,320 - $10,399
(f)	$200 – $299	$400 - $599	$800 - $1,199	$10,400 - $15,599
(g)	$300 – $399	$600 - $799	$1,200 – 1,599	$15,600 - $20,799
(h)	$400– $499	$800 - $999	$1,600 - $1,999	$20,800 - $25,999
(i)	$500 - $599	$1,000 - $1,199	$2,000 – $2,399	$26,000 - $31,199
(j)	$600 - $699	$1,200 – $1,399	$2,400 - $2,799	$31,200 - $36,399
(k)	$700 - $799	$1,400 - $1,599	$2,800 – $3,199	$36,400 - $41,599
(l)	$800 - $999	$1,600 – $1,999	$3,200 – $3,999	$41,600 - $51,999
(m)	$1,000 - $1,499	$2,000 - $2,999	$4,000 - $5,999	$52,000 - $78,799
(n)	$1,500 and over	$3,000 and over	$6,000 and over	$78,800 and over

44. At this point in time, to what extent has life in this village met your expectations? ***(please circle one response)***

(a) Exceeded my expectations

(b) Met my expectations

(c) Not met my expectations

45. Please rank from 1 (highest) to 3 (lowest) the three most important reasons for your response in question 44.

Reason	**Rank**
(a) Social atmosphere	
(b) Other residents	
(c) Number of units in village	
(d) Design and layout of village	
(e) Design and size of units	
(f) Management	
(g) Ongoing fees	
(h) Variety of facilities and services provided	
(i) Other (please specify:)	

46. Do you wish you had moved into a retirement village sooner than you did? ***(please circle one response)***

(a) Yes

(b) No

47. In general, do you think that any attempt should be made to create retirement villages that accommodate people from both public housing backgrounds and those wanting to live in private housing? ***(please circle one response)***

(a) Yes

(b) No

(c) Not sure

48. As far as you are concerned, should the people living in a retirement village be of the same social class, or of a different social class, or doesn't it matter? If possible, please write your reasons for your opinion. ***(please circle one response and write your reason/s for your response)***

(a) It's better if they are different

Reason:____

(b) It's better if they are the same

Reason:____

(c) It doesn't matter

Reason:____

49. Would you be prepared to move into a village where a proportion of the units were specifically for people who are eligible for rent support from the government (ie. they may be eligible for public housing)? ***(please circle one response)***

(a) Yes

(b) No

(c) Not sure

50. What do you think would be your main reasons for moving from an independent living unit within this village? ***(you may circle more than one of the following responses)***

(a) My health

(b) Health of my spouse / de facto / housemate

(c) Death of my spouse / de facto / housemate

(d) Affordability reasons

(e) Prefer to move in with family / friends

(f) Dislike this village and prefer to live in another one or in independent housing elsewhere

(g) Other (please specify:_______________________________)

51. Please think about the major things which you have done or which have happened since you moved into this retirement village. Of those that are relevant, could you indicate the approximate year in which any of the listed events occurred.

Year	Milestone/event	
	(a)	Spouse/de facto passed away
	(b)	Spouse/de facto transferred to higher level care
	(c)	Got married/ re-married
	(d)	Got separated/ divorced
	(e)	Engaged in voluntary work (either started or continued with)
	(f)	Engaged in part time paid work (either started or continued with)
	(g)	Engaged in full time paid work (either started or continued with)
	(h)	Stopped voluntary work
	(i)	Stopped part time paid work
	(j)	Stopped full time paid work
	(k)	Friend moved in with me/ I moved in with friend
	(l)	Friend moved out or passed away/ I moved out of friend's unit
	(m)	Moved to a more appealing unit
	(n)	Moved to a more affordable unit
N/a	(o)	None of the above

52. What could this retirement village do differently to entice more people to choose it as their home?

53. Generally speaking, what do you think retirement villages might need to do to attract more people to choose a retirement village as their home during their retirement years?

54. What were your sources of income you used for living expenses during the last financial year? ***(you may circle more than one of the following responses)***

(a) Full age / war veterans pension

(b) Part age / war veterans pension

(c) Full other social security benefit or pension

(d) Part other social security benefit or pension

(e) Rent assistance

(f) Rents from your own building or land

(g) Interest or dividends from investments

(h) Superannuation

(i) Savings

(j) Full time earnings

(k) Part time earnings

(l) Other (please specify:________________________________)

55. Are you better or worse off financially or about the same than before you moved into this village? ***(please circle one response)***

(a) Better off now

(b) Worse off

(c) About the same

Thank you for taking the time to complete this survey.

Please pass it to the village general manager by Friday, 1 December 2000.

6.3 *Appendix Three: General Manager Survey*

Office Use Only:

1. What is the name of your village? ____

2. In which year did your village open? _____________

3. Please complete the following table relating to the levels of care provided in your village.

Level of care		No. Units	No. Beds	No. Residents
(a)	Independent living units/condominium units		N/a	
(b)	Serviced apartments		N/a	
(c)	Supported residential facilities/services			
(d)	Low level residential aged care facilities (hostel)	N/a		
(e)	High level residential aged care facilities (nursing home)	N/a		

*****PLEASE NOTE, FOR THE REMAINING QUESTIONS, INDEPENDENT LIVING UNITS ALSO INCLUDE CONDOMINIUM UNITS*****

4. How many independent living units are vacant at present?________units

5. Over the last year, on average what percentage of independent living units were vacant?
_____________%

6. Of the independent living units that were vacant over the last year, for how long, on average, were they vacant?___________weeks

7. What do you believe is the average age of independent living residents when they first enter your village? _________years old

8. What do you believe is the average age of independent living residents in your village now?
________years old

9. What do you believe is the average length of stay of independent living residents in your village?_______years

10. How many persons (if couple, count as one) are currently on a waiting list for independent living units?__________persons

11. In total, how many staff (including management) are required to manage the day to day affairs and management of the independent living units?

_______________full time staff ______________part time/casual staff

12. If residents are unable to afford the entry contribution or ongoing service payments, what arrangements are available assist them? ***(you may circle more than one response)***

(a) No arrangements are available

(b) Residents pay a higher deferred management fee

(c) Residents may rent a designated unit

(d) Other (please specify:____)

13. Are the majority of independent living units in your village located in a multi storied building? ***(please circle one response)***

(a) Yes (go to question 15)

(b) No

14. Please indicate what best describes the layout of the independent living units in your village. ***(please circle one response)***

(a) The majority of units are detached from one another

(b) The majority of units are in duplexes

(c) The majority of units are connected to one another in rows

(d) The majority of units are grouped into clusters

(e) Other (please specify:__________________________________)

15. If *any* of the independent units in your village are built in rows, on average, how many units are there in each row?________

16. Please approximate the number of current independent living units covered by the various tenure arrangements in your village.

Tenure	**Number of independent living units**
(a) Strata / freehold	
(b) Leasehold	
(c) Loan and License	
(d) Company title	
(e) Rental	
(f) Other, please specify:	
(g) Other, please specify:	
Total	

17. Approximately, how many hectacres is your entire retirement village site? ______hectacres

18. Based on your observations, what aspect most attracts residents to your village (as opposed to other villages)?

19. Please complete the following table regarding the major events that have taken place in your village since the first resident moved in.

Year	**Event**	**Number of independent living units added**
Examples: * *1994-96* ** *1997* ** *1998*	*Stage two* *Construction of indoor swimming pool* *Opening of hostel*	*40 units* *N/a* *N/a*
	(a) Village opens / Stage one	
	(b) Stage two (if applicable)*	
	(c) Stage three (if applicable)	
	(d) Stage four (if applicable)	
	(e) Other (specify)**	
	(f) Other (specify)	
	(g) Other (specify)	

20. Please complete the following table regarding the future events planned over the short to medium term (ie. till 2010) in your village (eg. addition of spa, putting green, additional stage, renovation of community building etc.)

Year	Event	Number of independent living units to be added (if applicable)
Example: *2003* *2006*	 *Stage 5* *Upgrade community building*	 *50* *N/a*
	(a) Specify:	
	(b) Specify:	
	(c) Specify:	
	(d) Specify:	
	(e) Specify:	
	(f) Specify:	
	(g) Specify:	

21. Please circle those services and facilities that are currently provided in your village. ***(you may circle more than one response)***

(a) Pool/spa
(b) Gym
(c) Tennis court
(d) Bowling green
(e) Golf/putting green
(f) Organised social activities
(g) BBQ area
(h) Community centre
(i) Restaurant/café
(j) Residents workshop
(k) Games/crafts rooms
(l) Library
(m) Village bus
(n) Storage areas for boats/caravans
(o) 24 hour emergency call system
(p) Internet facilities
(q) Retail shop/s
(r) Other (please specify) ____________
(s) Other (please specify) ____________
(t) Other (please specify) ____________
(u) Other (please specify) ____________
(v) Other (please specify) ____________

22. What is the approximate distance (please specify in metres) from your village to the following:

(a)	Nearest public transport stop (significant)	____________metres
(b)	Shopping centre with supermarket	____________metres
(c)	Medical centre	____________metres
(d)	General practitioner	____________metres
(e)	Hospital	____________metres
(f)	Nearest beach, ocean or river	____________metres
(g)	Post office	____________metres
(h)	Bank	____________metres
(i)	Hairdresser	____________metres
(j)	Controlled crossing (pedestrian crossing or traffic lights)	____________metres
(k)	Major road	____________metres

23. Most retirement villages require residents to pay a deferred management fee (or exit fee) when they vacate their unit. If your village charges such a fee, please indicate the deferred management fee scale (as a percentage) in each year (or part thereof) of occupation for independent living units in your village.

Year	**Deferred Mgt Fee (% of purchase price)**
1	____________%
2	____________%
3	____________%
4	____________%
5	____________%
6	____________%
7	____________%
8	____________%
9	____________%
10	____________%

24. Please complete the following tables with respect to independent living units (including condominium units) within your village.

Number of Units

Number of Bedrooms	Number of independent living units/ condominium units
(a) 1 bedroom	
(b) 2 bedroom	
(c) 3 bedroom	
(d) 4+ bedroom	
Total	

Entry Contribution - New Unit

	New Unit (if available)		
Number of Bedrooms	**Current LOWEST Entry Contribution New Unit ($)**	**Current AVERAGE Entry Contribution New Unit ($)**	**Current HIGHEST Entry Contribution New Unit ($)**
(a) 1 bedroom			
(b) 2 bedroom			
(c) 3 bedroom			
(d) 4+ bedroom			

Entry Contribution - Resale Unit

	Resale Unit		
Number of Bedrooms	**Current LOWEST Entry Contribution Resale Unit ($)**	**Current AVERAGE Entry Contribution Resale Unit ($)**	**Current HIGHEST Entry Contribution Resale Unit ($)**
(a) 1 bedroom			
(b) 2 bedroom			
(c) 3 bedroom			
(d) 4+ bedroom			

25. What is the operating motive of your village? ***(please circle one response)***

(a) For profit

(b) Not for profit

26. What entity is the main owner (over 51% ownership) of your village? ***(please circle one response)***

(a) Private company

(b) Private investors / shareholders

(c) Church

(d) Charitable organisation

(e) Other (please specify:_________________________________)

27. In your experience which aspects (in general) most attract current retirees to retirement villages?

28. In your view, how will the next generation of retirees, the baby boomers, differ from current retirees?

29. In your view, what will these baby boomers demand and expect from retirement villages?

30. What steps has your retirement village taken or intends to take to meet these demands and expectations of baby boomers?

Thank you for taking the time to complete this survey.
Please forward this survey and the surveys completed by independent living residents by Friday 1 December 2000 in the stamped addressed envelope provided.

6.4 *Appendix Four: White's Heteroskedasticity Tests*

Table 23: White's Test - Model One

White Heteroskedasticity Test:

F-statistic	4.533542	Prob. F(24,186)	0.000000
Obs*R-squared	77.87471	Prob. Chi-Square(24)	0.000000

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Sample: 1 236 Included observations: 211
White Heteroskedasticity-Consistent Standard Errors & Covariance

R-squared	0.369074	Mean dependent var	2.62E+09
Adjusted R-squared	0.287665	S.D. dependent var	3.75E+09
S.E. of regression	3.16E+09	Akaike info criterion	46.69792
Sum squared resid	1.86E+21	Schwarz criterion	47.09506
Log likelihood	-4901.631	F-statistic	4.533542
Durbin-Watson stat	1.893678	Prob(F-statistic)	0.000000

Table 24: White's Test - Model Two

White Heteroskedasticity Test:

F-statistic	1.625603	Prob. F(24,186)	0.039382
Obs*R-squared	36.58455	Prob. Chi-Square(24)	0.048116

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Sample: 1 236 Included observations: 211
White Heteroskedasticity-Consistent Standard Errors & Covariance

R-squared	0.173386	Mean dependent var	0.052672
Adjusted R-squared	0.066727	S.D. dependent var	0.076840
S.E. of regression	0.074232	Akaike info criterion	-2.252381
Sum squared resid	1.024940	Schwarz criterion	-1.855241
Log likelihood	262.6261	F-statistic	1.625603
Durbin-Watson stat	1.536515	Prob(F-statistic)	0.039382

Table 25: White's Test - Model Three

White Heteroskedasticity Test:

F-statistic	3.157949	Prob. F(24,178)	0.000006
Obs*R-squared	60.62288	Prob. Chi-Square(24)	0.000052

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Sample: 1 241 Included observations: 203
White Heteroskedasticity-Consistent Standard Errors & Covariance

R-squared	0.298635	Mean dependent var	2.212804
Adjusted R-squared	0.204069	S.D. dependent var	2.913389
S.E. of regression	2.599179	Akaike info criterion	4.863152
Sum squared resid	1202.521	Schwarz criterion	5.271182
Log likelihood	-468.6099	F-statistic	3.157949
Durbin-Watson stat	2.106738	Prob(F-statistic)	0.000006

Table 26: White's Test - Model Four

Heteroskedasticity Test: White

F-statistic	2.086534	Prob. F(74,215)	0.0000
Obs*R-squared	121.2144	Prob. Chi-Square(74)	0.0004
Scaled explained SS	109.1087	Prob. Chi-Square(74)	0.0050

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Sample: 2 300
Included observations: 290
Collinear test regressors dropped from specification

R-squared	0.417981	Mean dependent var	9.95E+08
Adjusted R-squared	0.217658	S.D. dependent var	1.43E+09
S.E. of regression	1.26E+09	Akaike info criterion	44.96572
Sum squared resid	3.42E+20	Schwarz criterion	45.91482
Log likelihood	-6445.029	Hannan-Quinn criter.	45.34597
F-statistic	2.086534	Durbin-Watson stat	2.086004
Prob(F-statistic)	0.000022		

Table 27: White's Test - Model Five

Heteroskedasticity Test: White

F-statistic	1.936921	Prob. F(74,215)	0.0001
Obs*R-squared	115.9994	Prob. Chi-Square(74)	0.0013
Scaled explained SS	98.16803	Prob. Chi-Square(74)	0.0316

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Sample: 2 300
Included observations: 290
Collinear test regressors dropped from specification

R-squared	0.399998	Mean dependent var	0.005218
Adjusted R-squared	0.193486	S.D. dependent var	0.007250
S.E. of regression	0.006511	Akaike info criterion	-7.012757
Sum squared resid	0.009114	Schwarz criterion	-6.063650
Log likelihood	1091.850	Hannan-Quinn criter.	-6.632497
F-statistic	1.936921	Durbin-Watson stat	2.130449
Prob(F-statistic)	0.000126		

Table 28: White's Test - Model Six

Heteroskedasticity Test: White

F-statistic	1.951572	Prob. F(75,214)	0.0001
Obs*R-squared	117.7871	Prob. Chi-Square(75)	0.0012
Scaled explained SS	110.2976	Prob. Chi-Square(75)	0.0050

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Sample: 2 300
Included observations: 290
Collinear test regressors dropped from specification

R-squared	0.406162	Mean dependent var	9.58E+08
Adjusted R-squared	0.198042	S.D. dependent var	1.40E+09
S.E. of regression	1.25E+09	Akaike info criterion	44.95636
Sum squared resid	3.36E+20	Schwarz criterion	45.91812
Log likelihood	-6442.672	Hannan-Quinn criter.	45.34169
F-statistic	1.951572	Durbin-Watson stat	2.082115
Prob(F-statistic)	0.000101		

Table 29: White's Test - Model Seven

Heteroskedasticity Test: White

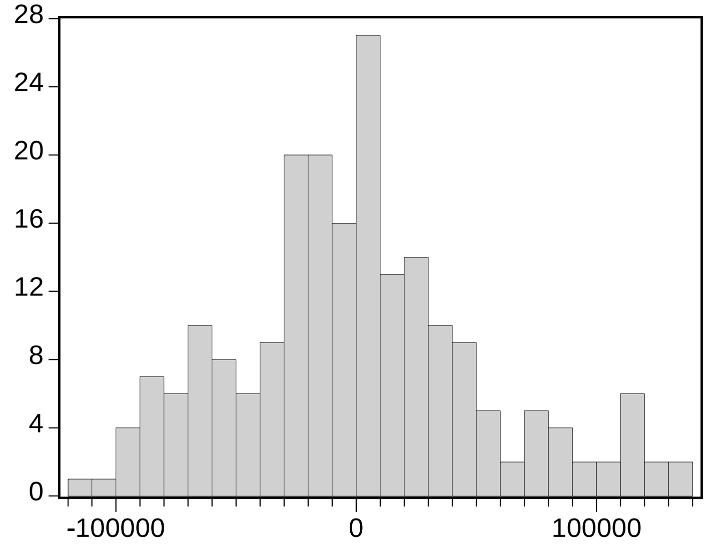
F-statistic	1.957282	Prob. F(75,214)	0.0001
Obs*R-squared	117.9915	Prob. Chi-Square(75)	0.0011
Scaled explained SS	101.7682	Prob. Chi-Square(75)	0.0216

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Sample: 2 300
Included observations: 290
Collinear test regressors dropped from specification

R-squared	0.406867	Mean dependent var	0.005132
Adjusted R-squared	0.198994	S.D. dependent var	0.007198
S.E. of regression	0.006442	Akaike info criterion	-7.031638
Sum squared resid	0.008882	Schwarz criterion	-6.069876
Log likelihood	1095.588	Hannan-Quinn criter.	-6.646309
F-statistic	1.957282	Durbin-Watson stat	2.134301
Prob(F-statistic)	0.000095		

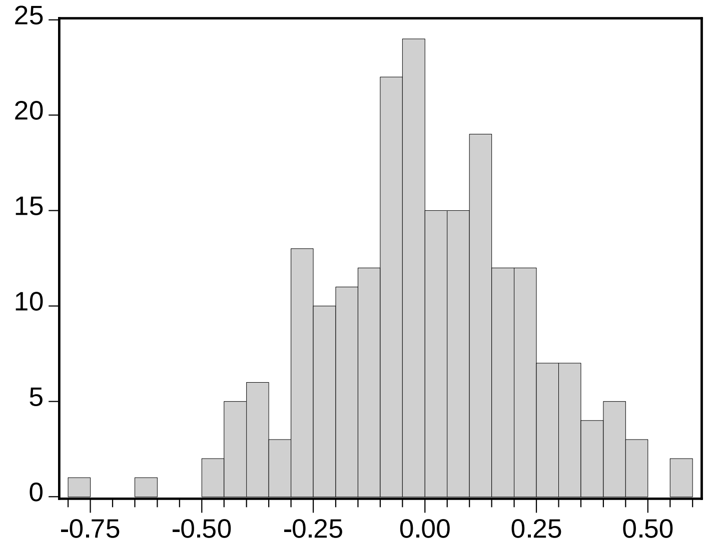
6.5 *Appendix Five: Jarque-Bera Tests for Normality of Errors*

Table 30: Jarque-Bera Test - Model One



Series: Residuals	
Sample 1 236	
Observations 211	
Mean	2.68e-11
Median	-1466.602
Maximum	130635.0
Minimum	-111523.1
Std. Dev.	51320.15
Skewness	0.381899
Kurtosis	3.033563
Jarque-Bera	5.138857
Probability	0.076579

Table 31: Jarque-Bera Test - Model Two



Series: Residuals	
Sample 1 236	
Observations 211	
Mean	7.45e-16
Median	-0.007800
Maximum	0.559690
Minimum	-0.786499
Std. Dev.	0.230049
Skewness	-0.128126
Kurtosis	3.118172
Jarque-Bera	0.700073
Probability	0.704662

Table 32: Jarque-Bera Test - Model Three

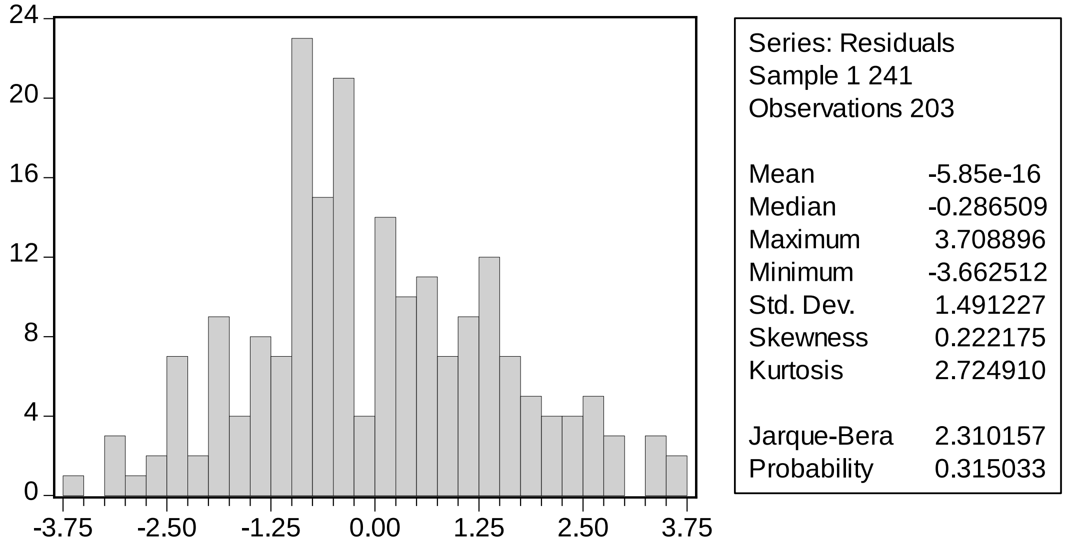


Table 33: Jarque-Bera Test - Model Four

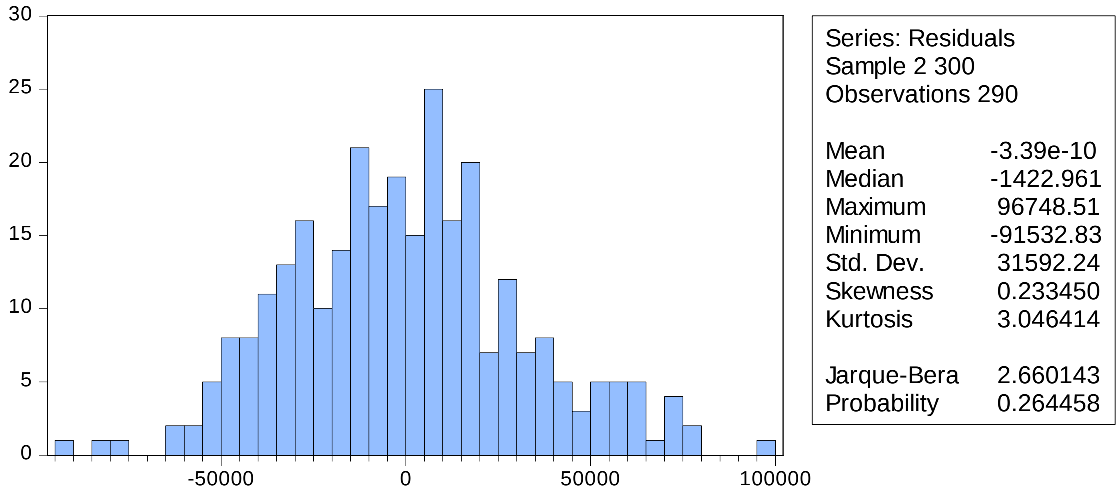


Table 34: Jarque-Bera Test - Model Five

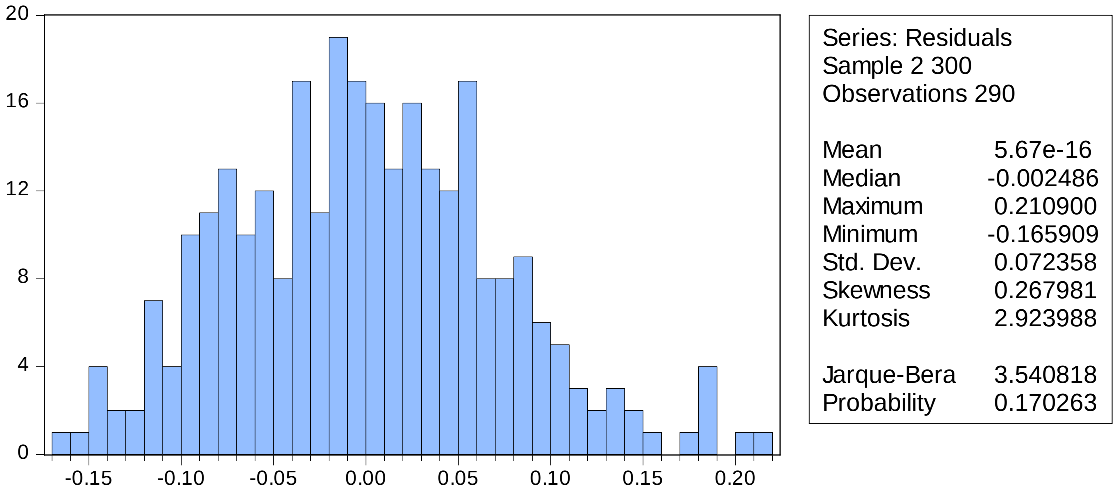


Table 35: Jarque-Bera Test - Model Six

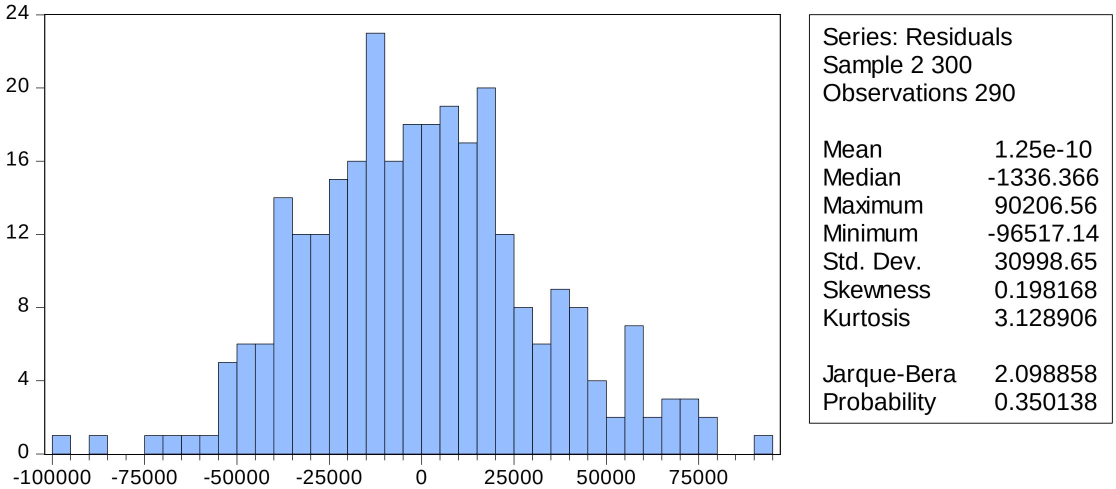
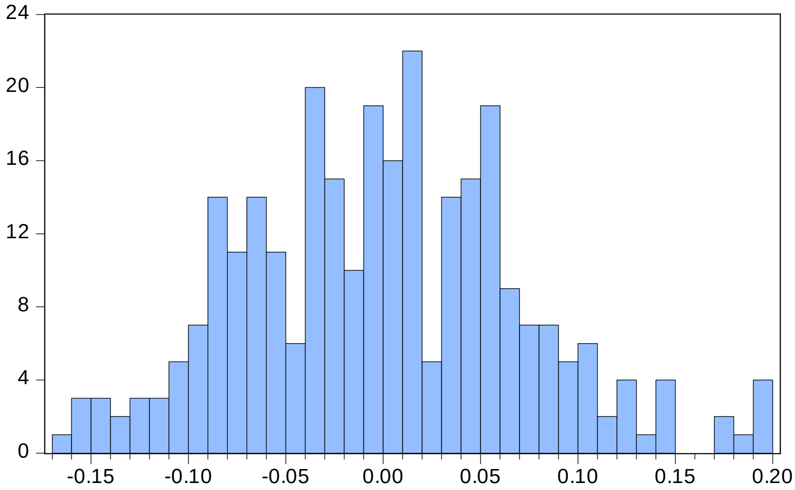


Table 36: Jarque-Bera Test - Model Seven



Series: Residuals	
Sample 2 300	
Observations 290	
Mean	1.99e-15
Median	-0.000487
Maximum	0.197649
Minimum	-0.162254
Std. Dev.	0.071758
Skewness	0.252665
Kurtosis	2.960873
Jarque-Bera	3.104080
Probability	0.211815

6.6 *Appendix Six: Variance Inflation Factor Tables*

The following table summarises the calculations for the Variance Inflation Factors relating to each of the models. Each independent variable's factor is calculated by regressing it against all other variables in the model. The resultant R^2 is the placed into the equation below to derive the factor. The complete regression outputs supporting the calculations can be found on the following pages.

$$VIF(\hat{\beta}_j) = \frac{1}{1 - R^2{}_j}$$

Table 37: Variance Inflation Factors – Models One and Two

Independent Variable	R^2	VIF
Deferred Management Fee	0.3249	1.48
Title	0.3486	1.54
Age	0.1240	1.14
Bedrooms	0.0689	1.07
Square Metres	0.1154	1.13
Pool	0.4508	1.82
Profit	0.1990	1.25
Metropolitan Location	0.3120	1.45
ACT	0.3264	1.48
NSW	0.4547	1.83
QLD	0.2211	1.28
SA	0.4408	1.79
TAS	0.1897	1.23
WA	0.2816	1.39
General Practitioner	0.7352	3.78
Medical Centre	0.7159	3.52
Hospital	0.1681	1.20

Table 38: Variance Inflation Factors – Model Three

Independent Variable	R^2	VIF
Deferred Management Fee	0.3348	1.50
Age	0.4358	1.77
Bedrooms	0.1755	1.21
Square Metres	0.3590	1.56
Pool	0.3718	1.59
Profit	0.5841	2.40
Tenure	0.0604	1.06
Metropolitan Location	0.4938	1.98
ACT	0.6885	3.21
NSW	0.4080	1.69
SA	0.1522	1.18
TAS	0.2605	1.35
WA	0.5286	2.12
General Practitioner	0.7467	3.95
Medical Centre	0.8130	5.35
Hospital	0.3912	1.64

Table 39: Variance Inflation Factors – Model Four

Variable	VIF
C	NA
AGE	1.751305
SIZE	1.833380
ATTACHED	1.919591
NEW	3.641140
AREA_PER_HOME	8.293763
FEES	7.920643
Q4_2010	3.535610
Q1_2011	9.007738
Q2_2011	7.402322
Q3_2011	7.227281
Q4_2011	9.536312
Q1_2012	11.25003
Q2_2012	11.41888
Q3_2012	5.537801
ED_MEDICAL_CENTRE	9.713041
ED_HOSPITAL	1.932442
MEDIAN_HOUSE_PRICE	11.57712

Table 40: Variance Inflation Factors – Model Five

Variable	VIF
C	NA
AGE	2.355430
SIZE	2.013940
ATTACHED	2.908477
NEW	3.491486
AREA_PER_HOME	11.64190
FEES	8.178977
Q4_2010	4.035572
Q1_2011	6.273016
Q2_2011	6.272305
Q3_2011	5.417212
Q4_2011	9.284152
Q1_2012	7.882617
Q2_2012	7.325889
Q3_2012	3.899008
ED_MEDICAL_CENTRE	7.572602
ED_HOSPITAL	3.655334
MEDIAN_HOUSE_PRICE	19.65292

Table 41: Variance Inflation Factors – Model Six

Variable	VIF
C	NA
AGE	1.744205
SIZE	1.841434
ATTACHED	1.821486
NEW	1.736651
AREA_PER_HOME	7.404680
FEES	7.066076
Q4_2010	3.460720
Q1_2011	8.624325
Q2_2011	7.222057
Q3_2011	6.950063
Q4_2011	9.990253
Q1_2012	10.20038
Q2_2012	10.98829
Q3_2012	6.543926
DD_MEDICAL_CENTRE	2.949176
DD_HOSPITAL	1.977787
MEDIAN_HOUSE_PRICE	3.126999

Table 42: Variance Inflation Factors – Model Seven

Variable	VIF
C	NA
AGE	2.315610
SIZE	1.968682
ATTACHED	2.935582
NEW	1.957452
AREA_PER_HOME	13.69214
FEES	12.28484
Q4_2010	3.969793
Q1_2011	5.801857
Q2_2011	6.169438
Q3_2011	5.170877
Q4_2011	9.466402
Q1_2012	7.250741
Q2_2012	6.421507
Q3_2012	4.109701
DD_MEDICAL_CENTRE	5.783631
DD_HOSPITAL	2.372263
MEDIAN_HOUSE_PRICE	4.893531

Models One and Two

Table 43: Models 1 and 2: VIF – Deferred Management Fee

Dependent Variable: DMF
Method: Least Squares
Date: 05/18/11 Time: 22:39
Sample (adjusted): 1 236
Included observations: 211 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	30.95173	4.206388	7.358269	0.0000
TITLE	-7.393597	1.846426	-4.004276	0.0001
AGE	0.047837	0.123043	0.388784	0.6979
BEDROOMS	-1.654173	1.031942	-1.602971	0.1106
SQMETERS	-0.000270	0.000103	-2.619566	0.0095
POOL	4.391090	1.986253	2.210741	0.0282
PROFIT	0.709284	1.899645	0.373377	0.7093
METRO	-1.535952	2.350488	-0.653461	0.5142
ACT	-9.947352	4.680738	-2.125168	0.0348
NSW	-7.011725	2.277238	-3.079048	0.0024
QLD	1.928317	3.780472	0.510073	0.6106
SA	-3.609675	2.720185	-1.326996	0.1861
TAS	3.563720	6.040474	0.589974	0.5559
WA	-2.830814	2.750529	-1.029189	0.3047
GENPRAC	-0.004807	0.000977	-4.918308	0.0000
MEDCENTRE	0.004322	0.000711	6.077182	0.0000
HOSPITAL	-0.000134	0.000182	-0.733047	0.4644

R-squared	0.324943	Mean dependent var	23.76445
Adjusted R-squared	0.269268	S.D. dependent var	12.61198
S.E. of regression	10.78107	Akaike info criterion	7.670599
Sum squared resid	22548.93	Schwarz criterion	7.940654
Log likelihood	-792.2482	F-statistic	5.836450
Durbin-Watson stat	2.032911	Prob(F-statistic)	0.000000

Table 44: Models 1 and 2: VIF –Title

Dependent Variable: TITLE
Method: Least Squares
Date: 05/18/11 Time: 22:40
Sample (adjusted): 1 236
Included observations: 211 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.749539	0.169440	4.423623	0.0000
DMF	-0.010325	0.002579	-4.004276	0.0001
AGE	0.009885	0.004545	2.175083	0.0308
BEDROOMS	-0.068443	0.038506	-1.777453	0.0771
SQMETERS	3.21E-06	3.92E-06	0.820206	0.4131
POOL	0.153724	0.074341	2.067828	0.0400
PROFIT	0.128737	0.070411	1.828360	0.0690
METRO	-0.190734	0.086862	-2.195841	0.0293
ACT	0.084902	0.176839	0.480110	0.6317
NSW	-0.235353	0.085501	-2.752625	0.0065
QLD	-0.463945	0.137391	-3.376826	0.0009
SA	-0.404633	0.097894	-4.133383	0.0001
TAS	0.393638	0.224160	1.756053	0.0807
WA	-0.350525	0.099948	-3.507076	0.0006
GENPRAC	-6.22E-05	3.85E-05	-1.615417	0.1078
MEDCENTRE	5.44E-05	2.87E-05	1.891503	0.0600
HOSPITAL	2.92E-06	6.82E-06	0.428029	0.6691

R-squared	0.348590	Mean dependent var	0.355450
Adjusted R-squared	0.294865	S.D. dependent var	0.479788
S.E. of regression	0.402889	Akaike info criterion	1.096825
Sum squared resid	31.48996	Schwarz criterion	1.366880
Log likelihood	-98.71506	F-statistic	6.488469
Durbin-Watson stat	2.054940	Prob(F-statistic)	0.000000

Table 45: Models 1 and 2: VIF – Age

Dependent Variable: AGE
Method: Least Squares
Date: 05/18/11 Time: 22:43
Sample (adjusted): 1 236
Included observations: 211 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	14.45039	2.573566	5.614930	0.0000
DMF	0.016275	0.041860	0.388784	0.6979
TITLE	2.408206	1.107179	2.175083	0.0308
BEDROOMS	-0.589302	0.604400	-0.975020	0.3308
SQMETERS	-3.51E-05	6.12E-05	-0.573174	0.5672
POOL	-1.196565	1.169885	-1.022805	0.3077
PROFIT	-3.673268	1.076583	-3.411969	0.0008
METRO	0.000276	1.372490	0.000201	0.9998
ACT	-1.403098	2.759918	-0.508384	0.6118
NSW	1.925318	1.353284	1.422701	0.1564
QLD	-0.974664	2.205425	-0.441939	0.6590
SA	-0.925499	1.592416	-0.581192	0.5618
TAS	1.737642	3.524212	0.493058	0.6225
WA	-0.802172	1.607659	-0.498969	0.6184
GENPRAC	0.000416	0.000604	0.689737	0.4912
MEDCENTRE	-4.93E-05	0.000453	-0.108897	0.9134
HOSPITAL	-8.42E-05	0.000106	-0.791062	0.4299

R-squared	0.124027	Mean dependent var	11.12796
Adjusted R-squared	0.051781	S.D. dependent var	6.457755
S.E. of regression	6.288336	Akaike info criterion	6.592408
Sum squared resid	7671.376	Schwarz criterion	6.862463
Log likelihood	-678.4990	F-statistic	1.716746
Durbin-Watson stat	2.042716	Prob(F-statistic)	0.046159

Table 46: Models 1 and 2: VIF – Bedrooms

Dependent Variable: BEDROOMS
Method: Least Squares
Date: 05/18/11 Time: 22:44
Sample (adjusted): 1 236
Included observations: 211 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.210894	0.287960	7.677785	0.0000
DMF	-0.007902	0.004930	-1.602971	0.1106
TITLE	-0.234128	0.131721	-1.777453	0.0771
AGE	-0.008275	0.008487	-0.975020	0.3308
SQMETERS	-6.22E-06	7.24E-06	-0.858738	0.3915
POOL	0.197938	0.138275	1.431488	0.1539
PROFIT	0.095574	0.131166	0.728652	0.4671
METRO	-0.110688	0.162444	-0.681392	0.4964
ACT	0.301858	0.326546	0.924397	0.3564
NSW	-0.153228	0.160821	-0.952786	0.3419
QLD	-0.015061	0.261469	-0.057602	0.9541
SA	0.086375	0.188761	0.457588	0.6478
TAS	0.004951	0.417875	0.011847	0.9906
WA	0.043248	0.190602	0.226904	0.8207
GENPRAC	5.00E-05	7.16E-05	0.699464	0.4851
MEDCENTRE	-4.93E-05	5.35E-05	-0.920516	0.3584
HOSPITAL	9.48E-06	1.26E-05	0.751669	0.4532

R-squared	0.068939	Mean dependent var	1.962085
Adjusted R-squared	-0.007850	S.D. dependent var	0.742251
S.E. of regression	0.745159	Akaike info criterion	2.326698
Sum squared resid	107.7207	Schwarz criterion	2.596753
Log likelihood	-228.4666	F-statistic	0.897777
Durbin-Watson stat	1.947559	Prob(F-statistic)	0.572597

Table 47: Models 1 and 2: VIF – Square Meters

Dependent Variable: SQMETERS
Method: Least Squares
Date: 05/18/11 Time: 22:45
Sample (adjusted): 1 236
Included observations: 211 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	6408.064	3220.502	1.989772	0.0480
DMF	-126.3952	48.25042	-2.619566	0.0095
TITLE	1075.715	1311.518	0.820206	0.4131
AGE	-48.20531	84.10235	-0.573174	0.5672
BEDROOMS	-608.8349	708.9878	-0.858738	0.3915
POOL	2389.555	1364.525	1.751199	0.0815
PROFIT	-3442.233	1275.790	-2.698118	0.0076
METRO	1517.997	1605.414	0.945548	0.3456
ACT	-3003.369	3230.699	-0.929634	0.3537
NSW	-2479.969	1584.877	-1.564771	0.1193
QLD	-162.7187	2586.918	-0.062901	0.9499
SA	-1322.636	1866.161	-0.708747	0.4793
TAS	-2196.373	4131.372	-0.531633	0.5956
WA	-802.1820	1885.151	-0.425527	0.6709
GENPRAC	0.078244	0.708784	0.110392	0.9122
MEDCENTRE	0.270304	0.530299	0.509720	0.6108
HOSPITAL	0.037470	0.124889	0.300029	0.7645

R-squared	0.115382	Mean dependent var	1626.490
Adjusted R-squared	0.042424	S.D. dependent var	7533.997
S.E. of regression	7372.455	Akaike info criterion	20.72603
Sum squared resid	1.05E+10	Schwarz criterion	20.99608
Log likelihood	-2169.596	F-statistic	1.581478
Durbin-Watson stat	2.317991	Prob(F-statistic)	0.076672

Table 48: Models 1 and 2: VIF – Pool

Dependent Variable: POOL
Method: Least Squares
Date: 05/18/11 Time: 22:50
Sample (adjusted): 1 236
Included observations: 211 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.045539	0.169802	-0.268191	0.7888
DMF	0.005596	0.002531	2.210741	0.0282
TITLE	0.140287	0.067843	2.067828	0.0400
AGE	-0.004482	0.004382	-1.022805	0.3077
BEDROOMS	0.052806	0.036889	1.431488	0.1539
SQMETERS	6.51E-06	3.72E-06	1.751199	0.0815
PROFIT	-0.001220	0.067841	-0.017983	0.9857
METRO	0.332621	0.080538	4.130012	0.0001
ACT	0.311017	0.167552	1.856240	0.0649
NSW	0.525334	0.074226	7.077502	0.0000
QLD	0.476859	0.130640	3.650188	0.0003
SA	-0.292246	0.095266	-3.067700	0.0025
TAS	0.612294	0.211311	2.897596	0.0042
WA	0.250767	0.096800	2.590564	0.0103
GENPRAC	-5.53E-05	3.68E-05	-1.503754	0.1343
MEDCENTRE	4.61E-05	2.75E-05	1.677341	0.0951
HOSPITAL	-1.55E-05	6.43E-06	-2.407922	0.0170

R-squared	0.450759	Mean dependent var	0.545024
Adjusted R-squared	0.405461	S.D. dependent var	0.499153
S.E. of regression	0.384879	Akaike info criterion	1.005361
Sum squared resid	28.73754	Schwarz criterion	1.275416
Log likelihood	-89.06555	F-statistic	9.950918
Durbin-Watson stat	2.173753	Prob(F-statistic)	0.000000

Table 49: Models 1 and 2: VIF – Profit

Dependent Variable: PROFIT
Method: Least Squares
Date: 05/18/11 Time: 22:55
Sample (adjusted): 1 236
Included observations: 211 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.754612	0.171374	4.403293	0.0000
DMF	0.001012	0.002712	0.373377	0.7093
TITLE	0.131583	0.071968	1.828360	0.0690
AGE	-0.015412	0.004517	-3.411969	0.0008
BEDROOMS	0.028557	0.039191	0.728652	0.4671
SQMETERS	-1.05E-05	3.89E-06	-2.698118	0.0076
POOL	-0.001366	0.075981	-0.017983	0.9857
METRO	0.052716	0.088820	0.593508	0.5535
ACT	0.254576	0.177952	1.430588	0.1542
NSW	0.167953	0.087284	1.924212	0.0558
QLD	0.013344	0.142922	0.093365	0.9257
SA	-0.186486	0.102364	-1.821795	0.0700
TAS	0.226215	0.227840	0.992867	0.3220
WA	-0.011214	0.104197	-0.107623	0.9144
GENPRAC	4.65E-05	3.90E-05	1.191508	0.2349
MEDCENTRE	-3.34E-05	2.92E-05	-1.143783	0.2541
HOSPITAL	-3.76E-06	6.90E-06	-0.544978	0.5864

R-squared	0.198956	Mean dependent var	0.744076
Adjusted R-squared	0.132891	S.D. dependent var	0.437417
S.E. of regression	0.407317	Akaike info criterion	1.118689
Sum squared resid	32.18602	Schwarz criterion	1.388744
Log likelihood	-101.0216	F-statistic	3.011498
Durbin-Watson stat	1.816121	Prob(F-statistic)	0.000163

Table 50: Models 1 and 2: VIF – Metropolitan Location

Dependent Variable: METRO
Method: Least Squares
Date: 05/18/11   Time: 23:01
Sample (adjusted): 1 236
Included observations: 211 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.942837	0.128402	7.342864	0.0000
DMF	-0.001430	0.002188	-0.653461	0.5142
TITLE	-0.127148	0.057904	-2.195841	0.0293
AGE	7.55E-07	0.003756	0.000201	0.9998
BEDROOMS	-0.021570	0.031656	-0.681392	0.4964
SQMETERS	3.02E-06	3.20E-06	0.945548	0.3456
POOL	0.242970	0.058830	4.130012	0.0001
PROFIT	0.034381	0.057929	0.593508	0.5535
ACT	-0.036762	0.144445	-0.254506	0.7994
NSW	-0.236816	0.069098	-3.427222	0.0007
QLD	-0.203049	0.114501	-1.773335	0.0777
SA	0.098972	0.083069	1.191433	0.2349
TAS	-0.013780	0.184467	-0.074704	0.9405
WA	-0.304753	0.081257	-3.750468	0.0002
GENPRAC	-0.000100	3.08E-05	-3.247498	0.0014
MEDCENTRE	-4.36E-06	2.37E-05	-0.183986	0.8542
HOSPITAL	6.59E-06	5.55E-06	1.186464	0.2369

R-squared	0.312006	Mean dependent var	0.824645
Adjusted R-squared	0.255264	S.D. dependent var	0.381175
S.E. of regression	0.328947	Akaike info criterion	0.691297
Sum squared resid	20.99197	Schwarz criterion	0.961352
Log likelihood	-55.93179	F-statistic	5.498695
Durbin-Watson stat	1.875719	Prob(F-statistic)	0.000000

Table 51: Models 1 and 2: VIF – ACT

Dependent Variable: ACT
Method: Least Squares
Date: 05/18/11 Time: 23:03
Sample (adjusted): 1 236
Included observations: 211 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.092166	0.071831	1.283090	0.2010
DMF	-0.002287	0.001076	-2.125168	0.0348
TITLE	0.013978	0.029114	0.480110	0.6317
AGE	-0.000948	0.001865	-0.508384	0.6118
BEDROOMS	0.014528	0.015716	0.924397	0.3564
SQMETERS	-1.48E-06	1.59E-06	-0.929634	0.3537
POOL	0.056109	0.030227	1.856240	0.0649
PROFIT	0.041006	0.028664	1.430588	0.1542
METRO	-0.009079	0.035674	-0.254506	0.7994
NSW	-0.134938	0.034011	-3.967524	0.0001
QLD	-0.091192	0.056987	-1.600221	0.1112
SA	-0.130494	0.040360	-3.233238	0.0014
TAS	-0.141623	0.091109	-1.554436	0.1217
WA	-0.106599	0.041114	-2.592779	0.0102
GENPRAC	-9.34E-05	1.42E-05	-6.570782	0.0000
MEDCENTRE	7.12E-05	1.06E-05	6.723398	0.0000
HOSPITAL	7.75E-07	2.77E-06	0.279699	0.7800

R-squared	0.326407	Mean dependent var	0.037915
Adjusted R-squared	0.270853	S.D. dependent var	0.191444
S.E. of regression	0.163474	Akaike info criterion	-0.707184
Sum squared resid	5.184430	Schwarz criterion	-0.437129
Log likelihood	91.60789	F-statistic	5.875491
Durbin-Watson stat	2.064024	Prob(F-statistic)	0.000000

Table 52: Models 1 and 2: VIF – New South Wales

Dependent Variable: NSW
Method: Least Squares
Date: 05/18/11 Time: 23:10
Sample (adjusted): 1 236
Included observations: 211 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.519854	0.141615	3.670906	0.0003
DMF	-0.006645	0.002158	-3.079048	0.0024
TITLE	-0.159711	0.058021	-2.752625	0.0065
AGE	0.005363	0.003770	1.422701	0.1564
BEDROOMS	-0.030397	0.031903	-0.952786	0.3419
SQMETERS	-5.03E-06	3.21E-06	-1.564771	0.1193
POOL	0.390636	0.055194	7.077502	0.0000
PROFIT	0.111508	0.057950	1.924212	0.0558
METRO	-0.241070	0.070340	-3.427222	0.0007
ACT	-0.556186	0.140185	-3.967524	0.0001
QLD	-0.514260	0.110450	-4.656056	0.0000
SA	-0.263754	0.081959	-3.218109	0.0015
TAS	-0.554602	0.181810	-3.050455	0.0026
WA	-0.469314	0.077932	-6.022114	0.0000
GENPRAC	-8.79E-05	3.13E-05	-2.809812	0.0055
MEDCENTRE	2.24E-05	2.38E-05	0.940878	0.3479
HOSPITAL	1.13E-05	5.56E-06	2.036594	0.0430

R-squared	0.454659	Mean dependent var	0.246445
Adjusted R-squared	0.409683	S.D. dependent var	0.431966
S.E. of regression	0.331888	Akaike info criterion	0.709102
Sum squared resid	21.36909	Schwarz criterion	0.979157
Log likelihood	-57.81026	F-statistic	10.10880
Durbin-Watson stat	2.130972	Prob(F-statistic)	0.000000

Table 53: Models 1 and 2: VIF – Queensland

Dependent Variable: QLD
Method: Least Squares
Date: 05/18/11 Time: 23:13
Sample (adjusted): 1 236
Included observations: 211 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.139675	0.089728	1.556650	0.1212
DMF	0.000695	0.001362	0.510073	0.6106
TITLE	-0.119659	0.035435	-3.376826	0.0009
AGE	-0.001032	0.002335	-0.441939	0.6590
BEDROOMS	-0.001136	0.019714	-0.057602	0.9541
SQMETERS	-1.25E-07	1.99E-06	-0.062901	0.9499
POOL	0.134769	0.036921	3.650188	0.0003
PROFIT	0.003367	0.036065	0.093365	0.9257
METRO	-0.078559	0.044300	-1.773335	0.0777
ACT	-0.142859	0.089274	-1.600221	0.1112
NSW	-0.195455	0.041979	-4.656056	0.0000
SA	-0.137704	0.050908	-2.704973	0.0074
TAS	-0.209690	0.113750	-1.843429	0.0668
WA	-0.191356	0.050508	-3.788611	0.0002
GENPRAC	-9.06E-06	1.97E-05	-0.460924	0.6454
MEDCENTRE	-3.30E-06	1.47E-05	-0.224204	0.8228
HOSPITAL	9.33E-06	3.40E-06	2.743166	0.0067

R-squared	0.221050	Mean dependent var	0.052133
Adjusted R-squared	0.156806	S.D. dependent var	0.222823
S.E. of regression	0.204609	Akaike info criterion	-0.258297
Sum squared resid	8.121757	Schwarz criterion	0.011758
Log likelihood	44.25034	F-statistic	3.440818
Durbin-Watson stat	2.183828	Prob(F-statistic)	0.000022

Table 54: Models 1 and 2: VIF – South Australia

Dependent Variable: SA
Method: Least Squares
Date: 05/18/11 Time: 23:15
Sample (adjusted): 1 236
Included observations: 211 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.493065	0.119879	4.113016	0.0001
DMF	-0.002492	0.001878	-1.326996	0.1861
TITLE	-0.200029	0.048393	-4.133383	0.0001
AGE	-0.001878	0.003231	-0.581192	0.5618
BEDROOMS	0.012482	0.027278	0.457588	0.6478
SQMETERS	-1.95E-06	2.76E-06	-0.708747	0.4793
POOL	-0.158308	0.051605	-3.067700	0.0025
PROFIT	-0.090195	0.049509	-1.821795	0.0700
METRO	0.073394	0.061601	1.191433	0.2349
ACT	-0.391824	0.121186	-3.233238	0.0014
NSW	-0.192139	0.059706	-3.218109	0.0015
QLD	-0.263936	0.097575	-2.704973	0.0074
TAS	-0.061561	0.158793	-0.387682	0.6987
WA	-0.288465	0.069444	-4.153929	0.0000
GENPRAC	-0.000145	2.52E-05	-5.768724	0.0000
MEDCENTRE	9.72E-05	1.92E-05	5.073643	0.0000
HOSPITAL	3.65E-06	4.79E-06	0.762151	0.4469

R-squared	0.440820	Mean dependent var	0.156398
Adjusted R-squared	0.394702	S.D. dependent var	0.364096
S.E. of regression	0.283270	Akaike info criterion	0.392305
Sum squared resid	15.56693	Schwarz criterion	0.662360
Log likelihood	-24.38820	F-statistic	9.558543
Durbin-Watson stat	2.213337	Prob(F-statistic)	0.000000

Table 55: Models 1 and 2: VIF – Tasmania

Dependent Variable: TAS
Method: Least Squares
Date: 05/18/11 Time: 23:17
Sample (adjusted): 1 236
Included observations: 211 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.083439	0.056175	-1.485331	0.1391
DMF	0.000503	0.000852	0.589974	0.5559
TITLE	0.039749	0.022636	1.756053	0.0807
AGE	0.000720	0.001461	0.493058	0.6225
BEDROOMS	0.000146	0.012335	0.011847	0.9906
SQMETERS	-6.62E-07	1.25E-06	-0.531633	0.5956
POOL	0.067751	0.023382	2.897596	0.0042
PROFIT	0.022349	0.022510	0.992867	0.3220
METRO	-0.002087	0.027943	-0.074704	0.9405
ACT	-0.086863	0.055881	-1.554436	0.1217
NSW	-0.082528	0.027054	-3.050455	0.0026
QLD	-0.082098	0.044535	-1.843429	0.0668
SA	-0.012575	0.032436	-0.387682	0.6987
WA	-0.041171	0.032618	-1.262205	0.2084
GENPRAC	-3.61E-06	1.23E-05	-0.293120	0.7697
MEDCENTRE	-1.96E-06	9.21E-06	-0.212636	0.8318
HOSPITAL	9.73E-06	2.05E-06	4.736602	0.0000

R-squared	0.189682	Mean dependent var	0.018957
Adjusted R-squared	0.122851	S.D. dependent var	0.136699
S.E. of regression	0.128027	Akaike info criterion	-1.196017
Sum squared resid	3.179827	Schwarz criterion	-0.925962
Log likelihood	143.1798	F-statistic	2.838255
Durbin-Watson stat	1.955174	Prob(F-statistic)	0.000363

Table 56: Models 1 and 2: VIF – Western Australia

Dependent Variable: WA
Method: Least Squares
Date: 05/18/11 Time: 23:17
Sample (adjusted): 1 236
Included observations: 211 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.545515	0.117484	4.643330	0.0000
DMF	-0.001918	0.001864	-1.029189	0.3047
TITLE	-0.170088	0.048498	-3.507076	0.0006
AGE	-0.001598	0.003202	-0.498969	0.6184
BEDROOMS	0.006135	0.027037	0.226904	0.8207
SQMETERS	-1.16E-06	2.73E-06	-0.425527	0.6709
POOL	0.133336	0.051470	2.590564	0.0103
PROFIT	-0.005324	0.049467	-0.107623	0.9144
METRO	-0.221831	0.059147	-3.750468	0.0002
ACT	-0.314181	0.121176	-2.592779	0.0102
NSW	-0.335587	0.055726	-6.022114	0.0000
QLD	-0.360013	0.095025	-3.788611	0.0002
SA	-0.283151	0.068165	-4.153929	0.0000
TAS	-0.197840	0.156742	-1.262205	0.2084
GENPRAC	-7.23E-05	2.65E-05	-2.730379	0.0069
MEDCENTRE	1.63E-05	2.02E-05	0.806133	0.4212
HOSPITAL	1.94E-06	4.75E-06	0.408366	0.6835

R-squared	0.281616	Mean dependent var	0.113744
Adjusted R-squared	0.222368	S.D. dependent var	0.318255
S.E. of regression	0.280648	Akaike info criterion	0.373709
Sum squared resid	15.28012	Schwarz criterion	0.643764
Log likelihood	-22.42632	F-statistic	4.753167
Durbin-Watson stat	2.133098	Prob(F-statistic)	0.000000

Table 57: Models 1 and 2: VIF – General Practitioner

Dependent Variable: GENPRAC
Method: Least Squares
Date: 05/18/11 Time: 23:19
Sample (adjusted): 1 236
Included observations: 211 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1464.403	312.2973	4.689131	0.0000
DMF	-23.06323	4.689261	-4.918308	0.0000
TITLE	-213.5407	132.1893	-1.615417	0.1078
AGE	5.873525	8.515599	0.689737	0.4912
BEDROOMS	50.26348	71.86000	0.699464	0.4851
SQMETERS	0.000803	0.007272	0.110392	0.9122
POOL	-208.2664	138.4977	-1.503754	0.1343
PROFIT	156.2657	131.1495	1.191508	0.2349
METRO	-515.4791	158.7311	-3.247498	0.0014
ACT	-1949.021	296.6193	-6.570782	0.0000
NSW	-444.9446	158.3539	-2.809812	0.0055
QLD	-120.7120	261.8913	-0.460924	0.6454
SA	-1008.751	174.8655	-5.768724	0.0000
TAS	-122.7244	418.6834	-0.293120	0.7697
WA	-511.8645	187.4701	-2.730379	0.0069
MEDCENTRE	0.593826	0.032733	18.14153	0.0000
HOSPITAL	0.016648	0.012597	1.321618	0.1879

R-squared	0.735205	Mean dependent var	1035.687
Adjusted R-squared	0.713366	S.D. dependent var	1394.825
S.E. of regression	746.7645	Akaike info criterion	16.14651
Sum squared resid	1.08E+08	Schwarz criterion	16.41657
Log likelihood	-1686.457	F-statistic	33.66506
Durbin-Watson stat	2.035056	Prob(F-statistic)	0.000000

Table 58: Models 1 and 2: VIF – Medical Centre

Dependent Variable: MEDCENTRE
Method: Least Squares
Date: 05/18/11 Time: 23:20
Sample (adjusted): 1 236
Included observations: 211 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-905.6803	435.3179	-2.080503	0.0388
DMF	36.99967	6.088293	6.077182	0.0000
TITLE	333.1598	176.1350	1.891503	0.0600
AGE	-1.240121	11.38806	-0.108897	0.9134
BEDROOMS	-88.27452	95.89675	-0.920516	0.3584
SQMETERS	0.004948	0.009707	0.509720	0.6108
POOL	309.8630	184.7347	1.677341	0.0951
PROFIT	-200.4243	175.2293	-1.143783	0.2541
METRO	-40.05152	217.6884	-0.183986	0.8542
ACT	2652.496	394.5172	6.723398	0.0000
NSW	202.5589	215.2872	0.940878	0.3479
QLD	-78.46235	349.9601	-0.224204	0.8228
SA	1205.210	237.5433	5.073643	0.0000
TAS	-118.9283	559.3034	-0.212636	0.8318
WA	205.3606	254.7477	0.806133	0.4212
GENPRAC	1.059477	0.058401	18.14153	0.0000
HOSPITAL	-0.011962	0.016879	-0.708659	0.4794

R-squared	0.715860	Mean dependent var	1281.659
Adjusted R-squared	0.692426	S.D. dependent var	1798.561
S.E. of regression	997.4700	Akaike info criterion	16.72546
Sum squared resid	1.93E+08	Schwarz criterion	16.99551
Log likelihood	-1747.536	F-statistic	30.54767
Durbin-Watson stat	1.923101	Prob(F-statistic)	0.000000

Table 59: Models 1 and 2: VIF – Hospital

Dependent Variable: HOSPITAL
Method: Least Squares
Date: 05/18/11 Time: 23:21
Sample (adjusted): 1 236
Included observations: 211 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	5230.782	1831.646	2.855782	0.0048
DMF	-20.65633	28.17874	-0.733047	0.4644
TITLE	323.0482	754.7342	0.428029	0.6691
AGE	-38.20847	48.30022	-0.791062	0.4299
BEDROOMS	306.4295	407.6656	0.751669	0.4532
SQMETERS	0.012378	0.041255	0.300029	0.7645
POOL	-1875.461	778.8709	-2.407922	0.0170
PROFIT	-406.7225	746.3100	-0.544978	0.5864
METRO	1093.309	921.4854	1.186464	0.2369
ACT	520.3999	1860.574	0.279699	0.7800
NSW	1847.153	906.9814	2.036594	0.0430
QLD	4001.737	1458.803	2.743166	0.0067
SA	817.2882	1072.345	0.762151	0.4469
TAS	10655.82	2249.676	4.736602	0.0000
WA	442.4711	1083.515	0.408366	0.6835
GENPRAC	0.535994	0.405559	1.321618	0.1879
MEDCENTRE	-0.215854	0.304595	-0.708659	0.4794

R-squared	0.168063	Mean dependent var	5969.905
Adjusted R-squared	0.099449	S.D. dependent var	4465.098
S.E. of regression	4237.260	Akaike info criterion	19.61836
Sum squared resid	3.48E+09	Schwarz criterion	19.88841
Log likelihood	-2052.737	F-statistic	2.449416
Durbin-Watson stat	1.900782	Prob(F-statistic)	0.002128

Model Three

Table 60: Model 3: VIF – Deferred Management Fee

Dependent Variable: DMF
Method: Least Squares
Date: 05/18/11 Time: 17:07
Sample: 1 241
Included observations: 203

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.252087	0.493178	0.511148	0.6099
AGE	0.030080	0.011064	2.718761	0.0072
POOL	-0.376574	0.199346	-1.889049	0.0604
SQMETERS	-1.48E-05	9.82E-05	-0.150379	0.8806
BEDROOMS	0.582252	0.151565	3.841598	0.0002
PROFIT	0.360429	0.221079	1.630315	0.1047
TENURE	0.008162	0.044986	0.181436	0.8562
METRO	0.558654	0.209053	2.672313	0.0082
ACT	-0.228193	0.501836	-0.454716	0.6498
NSW	0.824783	0.221154	3.729455	0.0003
SA	-0.514163	0.252931	-2.032820	0.0435
TAS	-0.140335	0.379026	-0.370253	0.7116
WA	-0.097568	0.244514	-0.399029	0.6903
GP	1.60E-05	0.000111	0.143840	0.8858
MEDCENTR	-0.000129	0.000108	-1.188539	0.2361
HOSPITAL	-4.86E-05	1.75E-05	-2.781926	0.0060

R-squared	0.334788	Mean dependent var	1.753695
Adjusted R-squared	0.281429	S.D. dependent var	1.066327
S.E. of regression	0.903910	Akaike info criterion	2.711364
Sum squared resid	152.7889	Schwarz criterion	2.972503
Log likelihood	-259.2035	F-statistic	6.274237
Durbin-Watson stat	2.123762	Prob(F-statistic)	0.000000

Table 61: Model 3: VIF – Age

Dependent Variable: AGE
Method: Least Squares
Date: 05/18/11 Time: 17:13
Sample: 1 241
Included observations: 203

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	11.19063	3.092872	3.618202	0.0004
DMF	1.264098	0.464954	2.718761	0.0072
POOL	4.227580	1.267388	3.335663	0.0010
SQMETERS	-0.000602	0.000635	-0.947793	0.3445
BEDROOMS	-0.719731	1.019211	-0.706165	0.4810
PROFIT	1.074211	1.441178	0.745371	0.4570
TENURE	-0.317513	0.290725	-1.092140	0.2762
METRO	-7.270241	1.274385	-5.704901	0.0000
ACT	-3.539727	3.244690	-1.090929	0.2767
NSW	0.139539	1.485974	0.093904	0.9253
SA	1.835085	1.652224	1.110676	0.2681
TAS	-2.836449	2.449202	-1.158112	0.2483
WA	2.662036	1.573763	1.691510	0.0924
GP	-0.001269	0.000715	-1.774935	0.0775
MEDCENTR	0.001579	0.000695	2.271111	0.0243
HOSPITAL	6.92E-05	0.000115	0.600000	0.5492

R-squared	0.435776	Mean dependent var	7.211823
Adjusted R-squared	0.390518	S.D. dependent var	7.505738
S.E. of regression	5.859680	Akaike info criterion	6.449605
Sum squared resid	6420.803	Schwarz criterion	6.710744
Log likelihood	-638.6349	F-statistic	9.628593
Durbin-Watson stat	2.170922	Prob(F-statistic)	0.000000

Table 62: Model 3: VIF – Bedrooms

Dependent Variable: BEDROOMS
Method: Least Squares
Date: 05/18/11 Time: 17:14
Sample: 1 241
Included observations: 203

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.026909	0.174876	11.59056	0.0000
DMF	0.125627	0.032702	3.841598	0.0002
AGE	-0.003695	0.005233	-0.706165	0.4810
SQMETERS	0.000144	4.44E-05	3.253650	0.0014
POOL	-0.103621	0.093168	-1.112195	0.2675
PROFIT	-0.209836	0.102274	-2.051704	0.0416
TENURE	-0.038048	0.020712	-1.837041	0.0678
METRO	-0.214803	0.097687	-2.198891	0.0291
ACT	0.298160	0.232210	1.284008	0.2007
NSW	-0.015735	0.106471	-0.147787	0.8827
SA	0.196767	0.117903	1.668895	0.0968
TAS	-0.046357	0.176089	-0.263257	0.7926
WA	0.142057	0.113149	1.255486	0.2109
GP	2.57E-06	5.17E-05	0.049799	0.9603
MEDCENTR	1.63E-05	5.05E-05	0.323356	0.7468
HOSPITAL	-6.11E-07	8.28E-06	-0.073850	0.9412

R-squared	0.175450	Mean dependent var	2.009852
Adjusted R-squared	0.109309	S.D. dependent var	0.444885
S.E. of regression	0.419866	Akaike info criterion	1.177776
Sum squared resid	32.96577	Schwarz criterion	1.438916
Log likelihood	-103.5443	F-statistic	2.652683
Durbin-Watson stat	1.569509	Prob(F-statistic)	0.001144

Table 63: Model 3: VIF – Square Meters

Dependent Variable: SQMETERS
Method: Least Squares
Date: 05/18/11 Time: 17:17
Sample: 1 241
Included observations: 203

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	97.88368	367.5289	0.266329	0.7903
DMF	-8.190465	54.46534	-0.150379	0.8806
AGE	-7.944574	8.382182	-0.947793	0.3445
BEDROOMS	371.1711	114.0784	3.253650	0.0014
POOL	199.3464	149.1816	1.336267	0.1831
PROFIT	-205.6544	165.1532	-1.245234	0.2146
TENURE	48.53382	33.32209	1.456506	0.1469
METRO	319.5064	156.9279	2.036008	0.0432
ACT	56.64025	373.9751	0.151455	0.8798
NSW	-706.3297	162.7417	-4.340187	0.0000
SA	-326.5542	188.9621	-1.728147	0.0856
TAS	914.4674	274.3883	3.332749	0.0010
WA	-543.2893	177.8186	-3.055301	0.0026
GP	0.137503	0.082234	1.672096	0.0962
MEDCENTR	-0.106878	0.080616	-1.325768	0.1865
HOSPITAL	-0.038548	0.012969	-2.972399	0.0033

R-squared	0.358993	Mean dependent var	764.7066
Adjusted R-squared	0.307576	S.D. dependent var	809.1076
S.E. of regression	673.2749	Akaike info criterion	15.93772
Sum squared resid	84766925	Schwarz criterion	16.19886
Log likelihood	-1601.679	F-statistic	6.981910
Durbin-Watson stat	1.977691	Prob(F-statistic)	0.000000

Table 64: Model 3: VIF – Pool

Dependent Variable: POOL
Method: Least Squares
Date: 05/18/11 Time: 17:18
Sample: 1 241
Included observations: 203

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.577250	0.174300	3.311818	0.0011
DMF	-0.049726	0.026323	-1.889049	0.0604
AGE	0.013284	0.003982	3.335663	0.0010
BEDROOMS	-0.063418	0.057020	-1.112195	0.2675
SQMETERS	4.74E-05	3.55E-05	1.336267	0.1831
PROFIT	-0.304585	0.077780	-3.916004	0.0001
TENURE	0.007745	0.016339	0.474039	0.6360
METRO	-0.260196	0.075029	-3.467964	0.0007
ACT	0.210877	0.181808	1.159886	0.2476
NSW	0.191323	0.082116	2.329916	0.0209
SA	0.026231	0.092902	0.282352	0.7780
TAS	-0.012000	0.137780	-0.087094	0.9307
WA	0.113583	0.088502	1.283404	0.2009
GP	2.56E-06	4.04E-05	0.063454	0.9495
MEDCENTR	-2.05E-05	3.95E-05	-0.518474	0.6047
HOSPITAL	-1.48E-05	6.38E-06	-2.313773	0.0218

R-squared	0.371832	Mean dependent var	0.197044
Adjusted R-squared	0.321444	S.D. dependent var	0.398749
S.E. of regression	0.328468	Akaike info criterion	0.686782
Sum squared resid	20.17563	Schwarz criterion	0.947922
Log likelihood	-53.70840	F-statistic	7.379412
Durbin-Watson stat	1.732891	Prob(F-statistic)	0.000000

Table 65: Model 3: VIF – Profit

Dependent Variable: PROFIT
Method: Least Squares
Date: 05/18/11 Time: 17:20
Sample: 1 241
Included observations: 203

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.197125	0.161454	1.220938	0.2236
DMF	0.038882	0.023850	1.630315	0.1047
AGE	0.002758	0.003700	0.745371	0.4570
BEDROOMS	-0.104916	0.051136	-2.051704	0.0416
SQMETERS	-4.00E-05	3.21E-05	-1.245234	0.2146
POOL	-0.248832	0.063542	-3.916004	0.0001
TENURE	-0.001418	0.014776	-0.095945	0.9237
METRO	-0.027037	0.069934	-0.386611	0.6995
ACT	0.687705	0.157063	4.378521	0.0000
NSW	0.218252	0.073579	2.966218	0.0034
SA	0.113851	0.083574	1.362282	0.1747
TAS	-0.072200	0.124424	-0.580277	0.5624
WA	0.445204	0.073452	6.061122	0.0000
GP	0.000109	3.57E-05	3.055756	0.0026
MEDCENTR	7.39E-05	3.53E-05	2.094685	0.0375
HOSPITAL	-2.41E-06	5.85E-06	-0.411432	0.6812

R-squared	0.584146	Mean dependent var	0.266010
Adjusted R-squared	0.550789	S.D. dependent var	0.442962
S.E. of regression	0.296887	Akaike info criterion	0.484609
Sum squared resid	16.48255	Schwarz criterion	0.745748
Log likelihood	-33.18780	F-statistic	17.51184
Durbin-Watson stat	2.027369	Prob(F-statistic)	0.000000

Table 66: Model 3: VIF – Tenure

Dependent Variable: TENURE
Method: Least Squares
Date: 05/18/11 Time: 17:21
Sample: 1 241
Included observations: 203

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	5.293607	0.702595	7.534367	0.0000
DMF	0.021564	0.118852	0.181436	0.8562
AGE	-0.019961	0.018277	-1.092140	0.2762
BEDROOMS	-0.465901	0.253615	-1.837041	0.0678
SQMETERS	0.000231	0.000159	1.456506	0.1469
POOL	0.154964	0.326900	0.474039	0.6360
PROFIT	-0.034721	0.361882	-0.095945	0.9237
METRO	-0.614608	0.343295	-1.790319	0.0750
ACT	0.297286	0.815854	0.364386	0.7160
NSW	0.022662	0.372592	0.060823	0.9516
SA	0.164002	0.415462	0.394746	0.6935
TAS	-0.032302	0.616296	-0.052414	0.9583
WA	-0.241500	0.397213	-0.607985	0.5439
GP	0.000146	0.000180	0.810869	0.4185
MEDCENTR	-0.000117	0.000177	-0.665559	0.5065
HOSPITAL	-1.90E-05	2.89E-05	-0.656130	0.5125

R-squared	0.060447	Mean dependent var	3.837438
Adjusted R-squared	-0.014918	S.D. dependent var	1.458392
S.E. of regression	1.469230	Akaike info criterion	3.682892
Sum squared resid	403.6652	Schwarz criterion	3.944032
Log likelihood	-357.8136	F-statistic	0.802056
Durbin-Watson stat	1.997903	Prob(F-statistic)	0.674491

Table 67: Model 3: VIF – Metropolitan Location

Dependent Variable: METRO
Method: Least Squares
Date: 05/18/11 Time: 21:59
Sample: 1 241
Included observations: 203

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.245173	0.142883	8.714641	0.0000
DMF	0.065844	0.024639	2.672313	0.0082
AGE	-0.020390	0.003574	-5.704901	0.0000
BEDROOMS	-0.117338	0.053362	-2.198891	0.0291
SQMETERS	6.79E-05	3.33E-05	2.036008	0.0432
POOL	-0.232240	0.066967	-3.467964	0.0007
PROFIT	-0.029539	0.076406	-0.386611	0.6995
TENURE	-0.027418	0.015315	-1.790319	0.0750
ACT	0.071492	0.172301	0.414922	0.6787
NSW	-0.030397	0.078666	-0.386409	0.6996
SA	0.219671	0.086305	2.545274	0.0117
TAS	0.110844	0.129918	0.853184	0.3946
WA	-0.252148	0.081930	-3.077592	0.0024
GP	-4.75E-05	3.80E-05	-1.247902	0.2136
MEDCENTR	3.00E-05	3.73E-05	0.803756	0.4226
HOSPITAL	-1.20E-05	6.05E-06	-1.974026	0.0499

R-squared	0.493824	Mean dependent var	0.773399
Adjusted R-squared	0.453222	S.D. dependent var	0.419667
S.E. of regression	0.310321	Akaike info criterion	0.573116
Sum squared resid	18.00788	Schwarz criterion	0.834256
Log likelihood	-42.17130	F-statistic	12.16247
Durbin-Watson stat	1.802405	Prob(F-statistic)	0.000000

Table 68: Model 3: VIF – Australian Capital Territory

Dependent Variable: ACT
Method: Least Squares
Date: 05/18/11 Time: 22:00
Sample: 1 241
Included observations: 203

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.048147	0.071790	-0.670673	0.5033
DMF	-0.004840	0.010644	-0.454716	0.6498
AGE	-0.001787	0.001638	-1.090929	0.2767
BEDROOMS	0.029311	0.022828	1.284008	0.2007
SQMETERS	2.17E-06	1.43E-05	0.151455	0.8798
POOL	0.033873	0.029203	1.159886	0.2476
PROFIT	0.135215	0.030881	4.378521	0.0000
TENURE	0.002387	0.006550	0.364386	0.7160
METRO	0.012866	0.031008	0.414922	0.6787
NSW	-0.038924	0.033263	-1.170170	0.2434
SA	-0.047191	0.037081	-1.272634	0.2047
TAS	-0.005028	0.055220	-0.091052	0.9275
WA	-0.105093	0.034787	-3.021046	0.0029
GP	-0.000160	1.12E-05	-14.34828	0.0000
MEDCENTR	0.000148	1.16E-05	12.79747	0.0000
HOSPITAL	-9.36E-07	2.59E-06	-0.360819	0.7186

R-squared	0.688507	Mean dependent var	0.054187
Adjusted R-squared	0.663521	S.D. dependent var	0.226946
S.E. of regression	0.131644	Akaike info criterion	-1.141887
Sum squared resid	3.240754	Schwarz criterion	-0.880748
Log likelihood	131.9016	F-statistic	27.55564
Durbin-Watson stat	2.214989	Prob(F-statistic)	0.000000

Table 69: Model 3: VIF – New South Wales

Dependent Variable: NSW
Method: Least Squares
Date: 05/18/11 Time: 22:02
Sample: 1 241
Included observations: 203

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.334938	0.155522	2.153634	0.0325
DMF	0.083937	0.022506	3.729455	0.0003
AGE	0.000338	0.003599	0.093904	0.9253
BEDROOMS	-0.007422	0.050220	-0.147787	0.8827
SQMETERS	-0.000130	2.99E-05	-4.340187	0.0000
POOL	0.147450	0.063285	2.329916	0.0209
PROFIT	0.205892	0.069412	2.966218	0.0034
TENURE	0.000873	0.014352	0.060823	0.9516
METRO	-0.026247	0.067925	-0.386409	0.6996
ACT	-0.186755	0.159597	-1.170170	0.2434
SA	-0.190889	0.080371	-2.375085	0.0186
TAS	0.172712	0.120297	1.435720	0.1528
WA	-0.462637	0.070321	-6.578931	0.0000
GP	-1.86E-05	3.55E-05	-0.525567	0.5998
MEDCENTR	-7.51E-05	3.43E-05	-2.192000	0.0296
HOSPITAL	-1.59E-05	5.56E-06	-2.864809	0.0047

R-squared	0.408015	Mean dependent var	0.152709
Adjusted R-squared	0.360530	S.D. dependent var	0.360596
S.E. of regression	0.288358	Akaike info criterion	0.426308
Sum squared resid	15.54908	Schwarz criterion	0.687447
Log likelihood	-27.27023	F-statistic	8.592437
Durbin-Watson stat	2.278401	Prob(F-statistic)	0.000000

Table 70: Model 3: VIF – South Australia

Dependent Variable: SA
Method: Least Squares
Date: 05/18/11 Time: 22:04
Sample: 1 241
Included observations: 203

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.056656	0.141075	-0.401602	0.6884
DMF	-0.042050	0.020685	-2.032820	0.0435
AGE	0.003571	0.003215	1.110676	0.2681
BEDROOMS	0.074584	0.044690	1.668895	0.0968
SQMETERS	-4.81E-05	2.79E-05	-1.728147	0.0856
POOL	0.016246	0.057537	0.282352	0.7780
PROFIT	0.086311	0.063358	1.362282	0.1747
TENURE	0.005077	0.012861	0.394746	0.6935
METRO	0.152428	0.059887	2.545274	0.0117
ACT	-0.181955	0.142975	-1.272634	0.2047
NSW	-0.153402	0.064588	-2.375085	0.0186
TAS	-0.135251	0.107980	-1.252554	0.2119
WA	-0.151858	0.069068	-2.198678	0.0291
GP	-2.23E-05	3.18E-05	-0.701322	0.4840
MEDCENTR	-2.85E-05	3.10E-05	-0.919081	0.3592
HOSPITAL	3.04E-06	5.09E-06	0.597577	0.5508

R-squared	0.152209	Mean dependent var	0.078818
Adjusted R-squared	0.084204	S.D. dependent var	0.270120
S.E. of regression	0.258498	Akaike info criterion	0.207677
Sum squared resid	12.49552	Schwarz criterion	0.468816
Log likelihood	-5.079200	F-statistic	2.238214
Durbin-Watson stat	2.135374	Prob(F-statistic)	0.006584

Table 71: Model 3: VIF – Tasmania

Dependent Variable: TAS
Method: Least Squares
Date: 05/18/11 Time: 22:05
Sample: 1 241
Included observations: 203

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.131830	0.094693	-1.392181	0.1655
DMF	-0.005220	0.014098	-0.370253	0.7116
AGE	-0.002511	0.002168	-1.158112	0.2483
BEDROOMS	-0.007992	0.030357	-0.263257	0.7926
SQMETERS	6.13E-05	1.84E-05	3.332749	0.0010
POOL	-0.003380	0.038811	-0.087094	0.9307
PROFIT	-0.024895	0.042902	-0.580277	0.5624
TENURE	-0.000455	0.008677	-0.052414	0.9583
METRO	0.034982	0.041002	0.853184	0.3946
ACT	-0.008817	0.096838	-0.091052	0.9275
NSW	0.063127	0.043969	1.435720	0.1528
SA	-0.061515	0.049112	-1.252554	0.2119
WA	0.102454	0.046579	2.199558	0.0291
GP	9.66E-07	2.15E-05	0.045013	0.9641
MEDCENTR	1.08E-05	2.10E-05	0.517277	0.6056
HOSPITAL	1.95E-05	3.13E-06	6.249241	0.0000

R-squared	0.260452	Mean dependent var	0.039409
Adjusted R-squared	0.201130	S.D. dependent var	0.195047
S.E. of regression	0.174332	Akaike info criterion	-0.580174
Sum squared resid	5.683226	Schwarz criterion	-0.319035
Log likelihood	74.88770	F-statistic	4.390477
Durbin-Watson stat	2.000692	Prob(F-statistic)	0.000000

Table 72: Model 3: VIF – Western Australia

Dependent Variable: WA
Method: Least Squares
Date: 05/18/11 Time: 22:06
Sample: 1 241
Included observations: 203

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.480947	0.143283	3.356634	0.0010
DMF	-0.008719	0.021852	-0.399029	0.6903
AGE	0.005661	0.003347	1.691510	0.0924
BEDROOMS	0.058840	0.046866	1.255486	0.2109
SQMETERS	-8.75E-05	2.86E-05	-3.055301	0.0026
POOL	0.076871	0.059896	1.283404	0.2009
PROFIT	0.368815	0.060849	6.061122	0.0000
TENURE	-0.008169	0.013436	-0.607985	0.5439
METRO	-0.191191	0.062124	-3.077592	0.0024
ACT	-0.442796	0.146570	-3.021046	0.0029
NSW	-0.406266	0.061753	-6.578931	0.0000
SA	-0.165943	0.075474	-2.198678	0.0291
TAS	0.246155	0.111911	2.199558	0.0291
GP	-6.24E-05	3.29E-05	-1.894962	0.0596
MEDCENTR	-3.86E-05	3.24E-05	-1.191464	0.2350
HOSPITAL	-2.42E-05	5.02E-06	-4.815136	0.0000

R-squared	0.528596	Mean dependent var	0.172414
Adjusted R-squared	0.490783	S.D. dependent var	0.378674
S.E. of regression	0.270219	Akaike info criterion	0.296373
Sum squared resid	13.65447	Schwarz criterion	0.557513
Log likelihood	-14.08188	F-statistic	13.97915
Durbin-Watson stat	1.932995	Prob(F-statistic)	0.000000

Table 73: Model 3: VIF – General Practitioner

Dependent Variable: GP
Method: Least Squares
Date: 05/18/11 Time: 22:07
Sample: 1 241
Included observations: 203

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	130.4542	324.3334	0.402223	0.6880
DMF	6.915256	48.07597	0.143840	0.8858
AGE	-13.05443	7.354879	-1.774935	0.0775
BEDROOMS	5.154432	103.5055	0.049799	0.9603
SQMETERS	0.107133	0.064071	1.672096	0.0962
POOL	8.395395	132.3061	0.063454	0.9495
PROFIT	436.5395	142.8581	3.055756	0.0026
TENURE	23.94285	29.52740	0.810869	0.4185
METRO	-174.0390	139.4652	-1.247902	0.2136
ACT	-3267.905	227.7559	-14.34828	0.0000
NSW	-79.15051	150.6001	-0.525567	0.5998
SA	-117.7519	167.8999	-0.701322	0.4840
TAS	11.22124	249.2862	0.045013	0.9641
WA	-301.8776	159.3054	-1.894962	0.0596
MEDCENTR	0.751650	0.045715	16.44216	0.0000
HOSPITAL	-0.000807	0.011714	-0.068921	0.9451

R-squared	0.746652	Mean dependent var	745.4926
Adjusted R-squared	0.726330	S.D. dependent var	1136.017
S.E. of regression	594.2895	Akaike info criterion	15.68815
Sum squared resid	66044652	Schwarz criterion	15.94929
Log likelihood	-1576.347	F-statistic	36.74107
Durbin-Watson stat	1.982946	Prob(F-statistic)	0.000000

Table 74: Model 3: VIF – Medical Centre

Dependent Variable: MEDCENTR
Method: Least Squares
Date: 05/18/11 Time: 22:08
Sample: 1 241
Included observations: 203

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	335.4993	330.9868	1.013634	0.3121
DMF	-58.23075	48.99356	-1.188539	0.2361
AGE	16.99630	7.483695	2.271111	0.0243
BEDROOMS	34.22530	105.8440	0.323356	0.7468
SQMETERS	-0.087125	0.065716	-1.325768	0.1865
POOL	-70.11651	135.2364	-0.518474	0.6047
PROFIT	310.0199	148.0031	2.094685	0.0375
TENURE	-20.11320	30.22001	-0.665559	0.5065
METRO	114.9379	143.0009	0.803756	0.4226
ACT	3155.198	246.5485	12.79747	0.0000
NSW	-333.6556	152.2151	-2.192000	0.0296
SA	-157.6946	171.5787	-0.919081	0.3592
TAS	131.8057	254.8069	0.517277	0.6056
WA	-195.2633	163.8851	-1.191464	0.2350
GP	0.786426	0.047830	16.44216	0.0000
HOSPITAL	-0.010152	0.011959	-0.848835	0.3971

R-squared	0.812990	Mean dependent var	1043.768
Adjusted R-squared	0.797989	S.D. dependent var	1352.483
S.E. of regression	607.8818	Akaike info criterion	15.73338
Sum squared resid	69100287	Schwarz criterion	15.99452
Log likelihood	-1580.938	F-statistic	54.19644
Durbin-Watson stat	2.064491	Prob(F-statistic)	0.000000

Table 75: Model 3: VIF – Hospital

Dependent Variable: HOSPITAL
Method: Least Squares
Date: 05/18/11 Time: 22:10
Sample: 1 241
Included observations: 203

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	11652.32	1837.560	6.341191	0.0000
DMF	-818.1776	294.1047	-2.781926	0.0060
AGE	27.75188	46.25316	0.600000	0.5492
BEDROOMS	-47.71637	646.1239	-0.073850	0.9412
SQMETERS	-1.170370	0.393746	-2.972399	0.0033
POOL	-1884.220	814.3495	-2.313773	0.0218
PROFIT	-375.7885	913.3665	-0.411432	0.6812
TENURE	-121.0134	184.4352	-0.656130	0.5125
METRO	-1708.035	865.2546	-1.974026	0.0499
ACT	-743.3081	2060.059	-0.360819	0.7186
NSW	-2637.972	920.8194	-2.864809	0.0047
SA	626.5506	1048.485	0.597577	0.5508
TAS	8845.028	1415.376	6.249241	0.0000
WA	-4559.784	946.9691	-4.815136	0.0000
GP	-0.031462	0.456488	-0.068921	0.9451
MEDCENTR	-0.378096	0.445429	-0.848835	0.3971

R-squared	0.391235	Mean dependent var	5920.690
Adjusted R-squared	0.342403	S.D. dependent var	4574.820
S.E. of regression	3709.828	Akaike info criterion	19.35090
Sum squared resid	2.57E+09	Schwarz criterion	19.61204
Log likelihood	-1948.116	F-statistic	8.011948
Durbin-Watson stat	1.972718	Prob(F-statistic)	0.000000

6.7 *Appendix Seven: Regression Equations*

Model One

Estimation Equation:

====================

PRICE = β_0 + β_1*DMF + β_2*TITLE + β_3*AGE + β_4*BEDROOMS + β_5*POOL + β_6*PROFIT + β_7*SQMETRES + β_8*METRO + β_9*ACT + β_{10}*NSW + β_{11}*QLD + β_{12}*SA + β_{13}*TAS + β_{14}*WA + β_{15}*GENPRAC + β_{16}*HOSPITAL + β_{17}*MEDCENTRE + ε

Substituted Coefficients:

====================

PRICE = -31000.53213 - 186.4989291*DMF + 22455.36345*TITLE - 1076.980637*AGE + 55304.02904*BEDROOMS - 0.29857743*SQMETERS + 27162.01192*POOL + 29861.47714*PROFIT + 72060.42383*METRO + 860.4735038*ACT + 121786.3198*NSW + 9601.578551*QLD - 2505.682623*SA - 75572.96793*TAS - 7552.581618*WA - 2.453277412*GENPRAC - 1.824804048*HOSPITAL + 2.847511*MEDCENTRE + e

Model Two

Estimation Equation:

====================

LNPRICE = β_0 + β_1*DMF + β_2*TITLE + β_3*AGE + β_4*BEDROOMS + β_5*POOL + β_6*PROFIT + β_7*SQMETRES + β_8*METRO + β_9*ACT + β_{10}*NSW + β_{11}*QLD + β_{12}*SA + β_{13}*TAS + β_{14}*WA + β_{15}*GENPRAC + β_{16}*HOSPITAL + β_{17}*MEDCENTRE + ε

Substituted Coefficients:

====================

LNPRICE = 10.84191884 + 0.002345409826*DMF + 0.04856176624*TITLE - 0.005169576564*AGE + 0.2751716247*BEDROOMS + 3.3750718e-007*SQMETERS + 0.1888450042*POOL + 0.1711338616*PROFIT + 0.3850024626*METRO + 0.07098663759*ACT + 0.5444843038*NSW + 0.06113462581*QLD - 0.02106353783*SA - 0.4017233573*TAS - 0.08417306833*WA - 2.307039828e-006*GENPRAC - 1.152950376e-005*HOSPITAL + 4.746731578e-006*MEDCENTRE + e

Model Three

Estimation Equation:

====================

$$ENTRYPRICE = \beta_0 + \beta_1*DMF + \beta_2*AGE + \beta_3*BEDROOMS + \beta_4*POOL + \beta_5*PROFIT + \beta_6*SQMETRES + \beta_7*METRO + \beta_8*ACT + \beta_9*NSW + \beta_{10}*SA + \beta_{11}*TAS + \beta_{12}*WA + \beta_{13}*GENPRAC + \beta_{14}*HOSPITAL + \beta_{15}*MEDCENTRE + \varepsilon$$

Substituted Coefficients:

====================

ENTRYPRICE = 6.726134301 - 0.412795946*DMF - 0.05167557747*AGE + 0.4714583174*BEDROOMS + 0.0002588826974*SQMETERS + 0.1589907354*POOL + 1.116959694*PROFIT - 0.4887357142*TENURE + 0.5705689885*METRO - 0.06815373941*ACT + 0.4724261472*NSW - 0.6066970075*SA + 0.5251145189*TAS + 0.6715195674*WA - 0.0003616428602*GP - 0.0001185907034*HOSPITAL + 0.0001156364698*MEDCENTR + e

Model Four

Estimation Equation:

=========================

PRICE = C(1) + C(2)*AGE + C(3)*SIZE + C(4)*ATTACHED + C(5)*NEW + C(6)*AREA_PER_HOME + C(7)*FEES + C(8)*Q4_2010 + C(9)*Q1_2011 + C(10)*Q2_2011 + C(11)*Q3_2011 + C(12)*Q4_2011 + C(13)*Q1_2012 + C(14)*Q2_2012 + C(15)*Q3_2012 + C(16)*ED_MEDICAL_CENTRE + C(17)*ED_HOSPITAL + C(18)*MEDIAN_HOUSE_PRICE

Substituted Coefficients:

=========================

PRICE = -752994.692467 + 961.114281468*AGE + 2010.98392417*SIZE + 29129.5026161*ATTACHED + 127915.31647*NEW - 114.328570883*AREA_PER_HOME + 1260.4087682*FEES + 14287.2281416*Q4_2010 + 30608.6000956*Q1_2011 + 27059.9279626*Q2_2011 + 20768.1251847*Q3_2011 + 10487.6453374*Q4_2011 + 19683.0563645*Q1_2012 + 1287.85804765*Q2_2012 + 4461.91309019*Q3_2012 - 20.2653655741*ED_MEDICAL_CENTRE - 14.7274673806*ED_HOSPITAL + 0.929259710884*MEDIAN_HOUSE_PRICE

Model Five

Estimation Equation:

=========================

LN_PRICE = C(1) + C(2)*AGE + C(3)*SIZE + C(4)*ATTACHED + C(5)*NEW + C(6)*AREA_PER_HOME + C(7)*FEES + C(8)*Q4_2010 + C(9)*Q1_2011 + C(10)*Q2_2011 + C(11)*Q3_2011 + C(12)*Q4_2011 + C(13)*Q1_2012 + C(14)*Q2_2012 + C(15)*Q3_2012 + C(16)*ED_MEDICAL_CENTRE + C(17)*ED_HOSPITAL + C(18)*MEDIAN_HOUSE_PRICE

Substituted Coefficients:

=========================

LN_PRICE = 10.6358314001 + 0.00177180022148*AGE + 0.00484769407304*SIZE + 0.0919999310775*ATTACHED + 0.433494873416*NEW - 0.000667803817396*AREA_PER_HOME + 0.00138779164913*FEES + 0.00648967923786*Q4_2010 + 0.0609128892339*Q1_2011 + 0.0530150392442*Q2_2011 + 0.0449441437939*Q3_2011 + 0.0167409043684*Q4_2011 + 0.0378183794961*Q1_2012 - 0.014876867896*Q2_2012 + 0.00727317117763*Q3_2012 - 3.23365870953e-05*ED_MEDICAL_CENTRE - 3.84948040309e-05*ED_HOSPITAL + 1.76993234847e-06*MEDIAN_HOUSE_PRICE

Model Six

Estimation Equation:

=========================

PRICE = C(1) + C(2)*AGE + C(3)*SIZE + C(4)*ATTACHED + C(5)*NEW + C(6)*AREA_PER_HOME + C(7)*FEES + C(8)*Q4_2010 + C(9)*Q1_2011 + C(10)*Q2_2011 + C(11)*Q3_2011 + C(12)*Q4_2011 + C(13)*Q1_2012 + C(14)*Q2_2012 + C(15)*Q3_2012 + C(16)*DD_MEDICAL_CENTRE + C(17)*DD_HOSPITAL + C(18)*MEDIAN_HOUSE_PRICE

Substituted Coefficients:

=========================

PRICE = -571104.183022 + 769.509973733*AGE + 2009.86576036*SIZE + 38250.7363818*ATTACHED + 126655.358284*NEW - 200.9706992*AREA_PER_HOME + 23.7106200073*FEES + 12309.2249116*Q4_2010 + 28211.5520741*Q1_2011 + 24559.8312657*Q2_2011 + 21789.5711836*Q3_2011 + 10660.5723949*Q4_2011 + 20027.3076299*Q1_2012 + 3800.47529264*Q2_2012 + 10894.5743791*Q3_2012 - 8.91589746377*DD_MEDICAL_CENTRE - 10.8761477322*DD_HOSPITAL + 1.08403892905*MEDIAN_HOUSE_PRICE

Model Seven

Estimation Equation:

=========================

LN_PRICE = C(1) + C(2)*AGE + C(3)*SIZE + C(4)*ATTACHED + C(5)*NEW + C(6)*AREA_PER_HOME + C(7)*FEES + C(8)*Q4_2010 + C(9)*Q1_2011 + C(10)*Q2_2011 + C(11)*Q3_2011 + C(12)*Q4_2011 + C(13)*Q1_2012 + C(14)*Q2_2012 + C(15)*Q3_2012 + C(16)*DD_MEDICAL_CENTRE + C(17)*DD_HOSPITAL + C(18)*MEDIAN_HOUSE_PRICE

Substituted Coefficients:

=========================

LN_PRICE = 11.023129023 + 0.00145973664527*AGE + 0.00482974670805*SIZE + 0.102270058497*ATTACHED + 0.41076738255*NEW - 0.000854982269121*AREA_PER_HOME - 0.00156907174043*FEES + 0.00343242470737*Q4_2010 + 0.057629489326*Q1_2011 + 0.0481503198484*Q2_2011 + 0.0491765324019*Q3_2011 + 0.0182009755827*Q4_2011 + 0.0397291136237*Q1_2012 - 0.00695452091725*Q2_2012 + 0.023147758881*Q3_2012 - 1.88738794075e-05*DD_MEDICAL_CENTRE - 2.64697809551e-05*DD_HOSPITAL + 2.32046662147e-06*MEDIAN_HOUSE_PRICE